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ABSTRACT

This guide is designed to provide summary information about support programs of the National Science Foundation, and is intended as a source of general guidance for institutions and individuals interested in participating in these programs. Program listings describe the principal characteristics and basic purpose of each activity, eligibility requirements, closing dates (where applicable), and the address from which more detailed information, brochures, or application forms may be obtained. (Author)

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NATIONAL SCIENCE FOUNDATION

# GUIDE TO PROGRAMS

FISCAL YEAR 1973

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This guide is designed to provide summary information about current programs of the National Science Foundation and is intended as a source of general guidance for institutions and individuals interested in participating in these programs. Program listings describe the principal characteristics and basic purposes of each activity, eligibility requirements, closing dates (when applicable), and the address from which more detailed information, brochures, or application forms may be obtained.

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Title VI of the Civil Rights Act of 1964 states: "No person in the United States shall, on grounds of race, color, or national origin, be excluded from participation in, or denied the benefits of, or be subject to discrimination under any program or activity receiving Federal financial assistance." All programs or activities receiving financial assistance from the National Science Foundation operate in compliance with this law.

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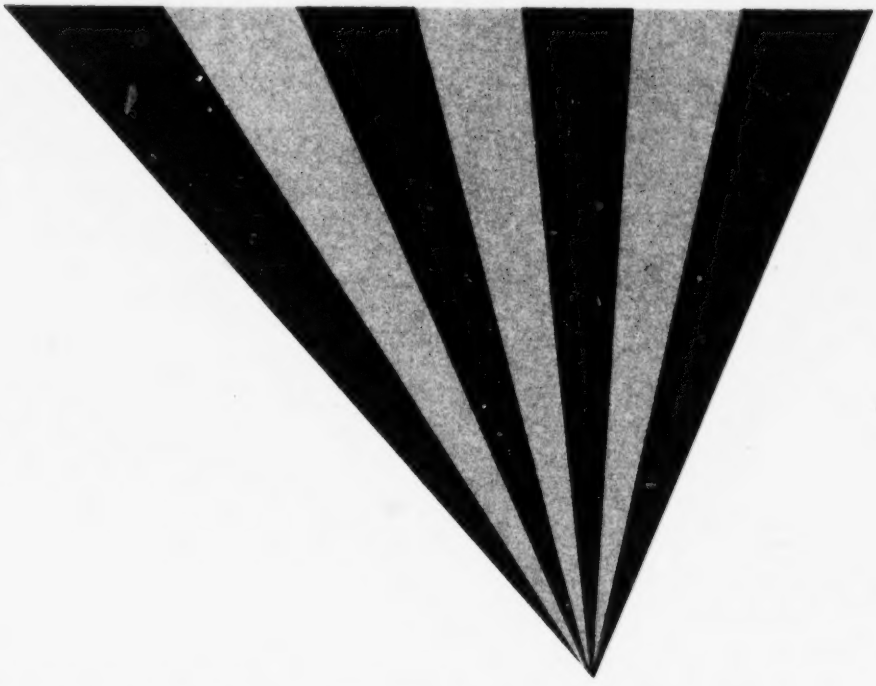

# GUIDE TO PROGRAMS

## NATIONAL SCIENCE FOUNDATION

**FISCAL YEAR 1973**

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## INTRODUCTION

The National Science Foundation is an agency of the Federal Government established in 1950 to advance scientific progress in the United States. The Foundation fulfills this responsibility primarily by sponsoring scientific research, encouraging and supporting improvements in science education, and fostering scientific information exchange. NSF does not itself conduct research or carry out education projects.

The Foundation supports scientific research and education projects in the mathematical, physical, medical, biological, social and engineering sciences—and in interdisciplinary areas comprised of overlapping fields such as oceanography, meteorology, geochemistry, etc. The Foundation does not support projects in clinical medicine, the arts and humanities, business areas, or social work.

The National Science Board is the policymaking body of the National Science Foundation. It consists of 25 members appointed by the President, by and with the consent of the Senate, and includes the Director of the Foundation who serves on a full-time basis. The Board passes on new Foundation programs and on grants or contracts requiring a total commitment of more than $2 million or an annual expenditure of more than $500,000.

Proposals for support are ordinarily assigned to the appropriate division or office for review and evaluation. An organization chart depicting the major areas of program activity is provided on page 86.

In making its decisions on proposals, the Foundation relies heavily on the advice and assistance of advisory panels, outside reviewers, and other experts to ensure that NSF is able to reach fair and knowledgeable judgments. These scientists and educators come from colleges and universities, from nonprofit research and educational organizations, from industry, and from other Government agencies. Their counsel has proven invaluable to the Foundation.

The National Science Foundation Act of 1950, as amended, permits the Foundation to support basic research, without limit. Moreover, pursuant to a provision of this Act, the President has recently directed that:

> The Foundation, in making grants or contracts for applied scientific research relevant to national problems involving the public interest, may support such work at other than academic and nonprofit institutions when the Director of the National Science Foundation determines that it would be

advantageous to use the capabilities of such other institutions to accomplish the program objectives.

Within the limits of this Directive, it is the policy of the National Science Foundation to support research at industrial or commercial organizations when it is advantageous for the attainment of its program objectives. The Director of the Foundation shall determine in which research program areas industrial and commercial organizations will be encouraged to participate, and shall approve the criteria for participation in the program.

The Foundation will continue to emphasize its traditional role of support for a strong national basic research capacity, particularly in academic institutions, and the improvement of science education. At the same time, the participation of individual industry and other nonacademic organizations is encouraged in the following NSF program areas:

1. RANN (Research Applied to National Needs)
2. Experimental R&D Incentives Program
3. National R&D Assessment Program
4. International Decade of Ocean Exploration Program
5. Computer Applications in Research Programs
6. Computer Impact on Society Program

Also, collaboration between industry and university researchers, as well as between industry and State or local governments, on appropriate programs is encouraged. Similarly, broader efforts through industry associations, groups of companies, or professional societies may be supported. Prospective proposers are encouraged to contact the appropriate program for program announcements and brochures and for preliminary discussions and guidance prior to the submission of a proposal.

Generally, awards are made in response to both solicited and unsolicited proposals. Normally, awards resulting from unsolicited proposals are made on a cost-sharing or jointly funded basis while those from solicited proposals may provide for payment of full costs including fee. Proposals in response to specific program announcements are considered solicited only when the announcement so indicates.

Disposition of rights to data and inventions resulting from Government-supported research are subject to negotiation. Factors to be considered are the nature and purpose of the project and other factors involving the public interest, the commercial position of the awardee, and any equities he may have. At a minimum the Government

will receive a royalty-free, paid-up license and the right to require the licensing of others on reasonable terms in certain circumstances.

Changes to the list of NSF programs in which industry and other nonacademic organizations are encouraged to participate will be published in the Federal Register.

The National Science Foundation looks forward to being able to utilize and properly integrate the capabilities of all institutions in the support of science and its contribution to society and the nation.

## Contents


| | | Page |
|---|---|---|
| I | **SCIENTIFIC RESEARCH PROJECT SUPPORT** | 1 |
| | Scientific Research Projects | 3 |
| | Engineering Research Initiation Grants | 4 |
| | Doctoral Dissertation Research | 5 |
| | Specialized Research Facilities and Equipment | 6 |
| II | **NATIONAL AND SPECIAL RESEARCH PROGRAMS** | 7 |
| | International Biological Program | 8 |
| | Global Atmospheric Research Program | 9 |
| | International Decade of Ocean Exploration | 10 |
| | Arctic Research Program | 11 |
| | U.S. Antarctic Research Program | 12 |
| | Oceanographic Facilities and Support | 13 |
| | Ocean Sediment Coring Program | 14 |
| III | **RESEARCH APPLICATIONS** | 15 |
| | Advanced Technology Applications | 18 |
| | Environmental Systems and Resources | 20 |
| | Social Systems and Human Resources | 22 |
| | Exploratory Research and Problem Assessment | 23 |
| | Intergovernmental Science Programs | 25 |
| IV | **NATIONAL RESEARCH CENTERS** | 27 |
| | National Astronomy and Ionosphere Center | 28 |
| | Cerro Tololo Inter-American Observatory | 29 |
| | Kitt Peak National Observatory | 30 |
| | National Radio Astronomy Observatory | 31 |
| | National Center for Atmospheric Research | 32 |
| V | **INTERNATIONAL COOPERATIVE SCIENTIFIC ACTIVITIES** | 33 |
| | United States-Australia Cooperative Science Program | 34 |
| | United States-Brazil Cooperative Science Program | 35 |
| | United States-Republic of China Cooperative Science Program | 36 |
| | East Europe Cooperative Science Programs: Romania, Hungary, Czechoslovakia, Bulgaria | 37 |
| | United States-France Exchange of Scientists Program | 38 |
| | United States-India Exchange of Scientists Program | 39 |
| | United States-Italy Cooperative Science Program | 40 |
| | United States-Japan Cooperative Science Program | 41 |
| | Scientists and Engineers in Economic Development Program | 42 |
| VI | **SCIENCE EDUCATION** | 43 |
| | HIGHER EDUCATION PROGRAMS | |
| | Graduate Fellowships | 44 |
| | Graduate Traineeships | 45 |

North Atlantic Treaty Organization (NATO) Postdoctoral Fellowships ..... 46
North Atlantic Treaty Organization (NATO) Senior Fellowships ..... 47
North Atlantic Treaty Organization (NATO) Advanced Study Institute Participant Grants ..... 48
Advanced Science Education ..... 49
Summer Institutes for College Teachers ..... 50
Short Courses for College Teachers ..... 51
Student-Originated Studies ..... 52
Undergraduate Research Participation ..... 53
Technician Education Development ..... 54
College Science Improvement Programs ..... 55
Undergraduate Science Course Improvement ..... 58
Undergraduate Instructional Scientific Equipment ..... 59

PRE-COLLEGE EDUCATION PROGRAMS

Leadership Development Projects for Secondary School Teachers and Supervisors ..... 60
Summer Institutes and Short Courses for Secondary School Teachers ..... 62
In-Service Institutes for Secondary School Teachers ..... 64
Cooperative College-School Science Program ..... 65
Curriculum and Instruction Development ..... 66
Student Science Training Program ..... 67

EXPERIMENTAL PROGRAMS

Pre-Service Teacher Education ..... 68
Technological Innovation in Education ..... 69

**VII COMPUTING ACTIVITIES** **71**

Computer Science and Engineering Programs ..... 72
Computer Applications in Research Programs ..... 73
Computer Impact on Society ..... 74

**VIII SPECIAL PROGRAMS** **75**

Experimental R&D Incentives Program ..... 76
National R&D Assessment Program ..... 77
Institutional Grants for Research Management Improvement ..... 78
Institutional Grants for Science ..... 79
International Travel Grants ..... 80
Scientific Conference Grants ..... 81
Science Information Service ..... 82
Special Foreign Currency Programs ..... 83
Public Understanding of Science Program ..... 85

NSF Organization Chart ..... 86

# I. SCIENTIFIC RESEARCH PROJECT SUPPORT

The National Science Foundation provides comprehensive support to research in all the sciences. Major mechanisms through which research is supported include project grants to scientists, primarily at universities and colleges and cooperative national research programs of a specialized nature. In addition, the Foundation assists in the procurement of specialized research facilities and equipment.

The Foundation considers all proposals for the support of research projects, regardless of source. The majority of such requests are submitted by U.S. universities and colleges on behalf of individual scientists or groups of scientists on their faculties. Foundation policy is to emphasize research that contributes to graduate and postdoctoral education in the sciences. Support of research at foreign institutions is provided only when it is clearly in the interest of science in the United States.

Research project proposals are considered primarily on the basis of scientific merit. Scientific merit is assessed according to the promise of significant scientific results, the possible scientific impact, the probable opening of a new field, the educational byproducts, and potential applications.

Programs described in chapter I are administered by the office of the Assistant Director for Research. Other programs administered by this directorate will be found in chapter II, National and Special Research Programs.



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## Scientific Research Projects

The National Science Foundation awards grants to support research in science, engineering, and mathematics. On rare occasions research support may take the form of a contract rather than a grant; proposals directed at grants or contracts are prepared in an identical manner.

A research project grant may support either a specific research project or research in a coherent area of science.

Research support is given to the full spectrum of sciences, including:

**Biological & Medical Sciences**
(excludes clinical aspects)
cellular biology; ecology; evolutionary and systematic biology; molecular biology; physiological processes; psychobiology and neurobiology.

**Engineering**
chemical processes; heat transfer; plasma dynamics and nuclear engineering; thermodynamics and mass transfer; civil and environmental technology; fluid mechanics; industrial technology; solid mechanics; control and automation; devices and waves; electrical and optical communications; systems theory and applications.

**Mathematical & Physical Sciences**
astronomy; chemistry; mathematics; physics.

**Materials Research**
physics and chemistry of solids and liquids; polymer science; materials engineering.

**Social Sciences**
anthropology; economic and social geography; economics; history and philosophy of science; law and social science; linguistics; political science; science policy; social psychology; sociology and social indicators.

**Environmental Sciences**
atmospheric sciences; earth sciences; physical and biological oceanography.

Institutions are required to share in the cost of each unsolicited research project supported by an NSF grant. Before submitting a proposal for research support the brochure **Grants for Scientific Research** should be consulted. The Foundation does not require standard application forms for research proposals.

Grants normally provide support for periods up to 24 months. Projects of high scientific merit may be approved scientifically for periods up to 60 months and will be funded on an annual basis for the term of the approval, contingent upon the availability of funds and the scientific progress of the research.

### Eligibility

Proposals may be submitted by colleges and universities and by academically related nonprofit research organizations. The conditions under which support is occasionally provided to other types of organizations and to individuals is described in the NSF brochure **Grants for Scientific Research,** available from the address below. Inquiry may also be made directly to the Assistant Director for Research.

### Deadlines

Proposals may be submitted at any time. Approximately 6 months should be allowed for the consideration of a proposal.

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*Additional Information*

Communications may be addressed to the appropriate division: Division of Biological and Medical Sciences, Division of Engineering, Division of Environmental Sciences, Division of Mathematical and Physical Sciences, Division of Materials Research, or Division of Social Sciences; National Science Foundation, Washington, D.C. 20550.

## Engineering Research Initiation Grants

The National Science Foundation awards grants to encourage the development of meritorious graduate research programs by engineering faculty members.

The usual duration of a grant will include the first summer, and the following academic year and summer. The grant amount will not normally exceed $21,000.

### Eligibility

A proposal may be submitted on behalf of an individual who:

(1) Is an assistant professor, instructor (or equivalent level), holding a full-time, regular academic appointment on the engineering teaching faculty of an institution of higher education within the United States that confers graduate degrees in engineering;

(2) Is a citizen or permanent resident of the United States as of date of submission of proposal;

(3) Has had no substantial research support.

### Deadlines

Instructions for preparing engineering research initiation proposals are available in early October from the offices listed below. Application deadline is early December. Awards are made in mid-March.

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*Additional Information*

Brochure **Engineering Research Initiation Grants.** Communications may be addressed to: Division of Engineering or Division of Materials Research, National Science Foundation, Washington, D.C. 20550.

## Doctoral Dissertation Research

The National Science Foundation awards grants to improve the scientific quality of dissertations in the social sciences and certain sciences involving extensive field work. Grants are awarded for periods up to 24 months. Grant funds may not be used as a stipend for the doctoral candidate, although he may receive support from other sources.

In collaboration with the Office of Economic Opportunity, special grants are also awarded by the Foundation in support of doctoral thesis research centrally related to problems of poverty.

### Eligibility

Proposals may be submitted by universities on behalf of doctoral candidates for the support of dissertation research in systematic biology, ecology, and ethology (biological and medical sciences); oceanography, earth sciences, and atmospheric sciences (environmental sciences); and the social sciences, including science policy and problems of poverty. Proposals should be submitted by the dissertation advisor, department chairman, or chairman of the departmental committee on doctoral degrees.

### Deadlines

Proposals may be submitted at any time; one or more grant requests may be made in a single proposal if the budget for each request is set forth separately. Four months should be allowed for processing the grant application.

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*Additional Information*

A leaflet that sets forth application procedures is available from the Foundation. Communications may be addressed to: Division of Biological and Medical Sciences, Division of Environmental Sciences, or Division of Social Sciences, National Science Foundation, Washington, D.C. 20550.

## Specialized Research Facilities and Equipment

The National Science Foundation awards grants for specialized research facilities and major items of research equipment within the regular research competition.

Facilities supported under this program are those required for highly specialized scientific purposes, as distinct from laboratory buildings used in normal academic research programs. Examples are: controlled-environment biological laboratories, some marine research equipment and support facilities, mobile laboratories, off-campus research facilities, and unique one-of-a-kind research facilities. Grants may provide for construction or modernization of facilities.

Equipment support may be provided where a research tool is needed by several investigators in a department. Examples are: electron microscopes, mass spectrometers, cryogenic equipment, and special-purpose computers.

The National Science Foundation encourages local contributions from non-Federal funds whenever possible; however, there is no fixed requirement as to the amount of funds that institutions must contribute.

Before submitting a proposal for specialized research facilities and equipment the NSF brochure **Grants for Scientific Research** should be consulted. The Foundation does not provide standard application forms for research facilities and equipment proposals.

### Eligibility

Institutions eligible to submit proposals are colleges and universities offering graduate studies (though in exceptional circumstances colleges and universities without graduate programs may be eligible), associations of colleges and universities, and nonprofit research institutions such as research museums.

### Deadlines

Proposals may be submitted at any time. Approximately 4 to 6 months are required for consideration of a proposal.

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*Additional Information*

See also page 13, Oceanographic Facilities and Support.

The NSF brochure **Grants for Scientific Research** is available from the Foundation. Communications may be addressed to the appropriate division: Division of Biological and Medical Sciences, Division of Engineering, Division of Environmental Sciences, Division of Mathematical and Physical Sciences, Division of Social Sciences, or Division of Materials Research, National Science Foundation, Washington, D.C. 20550.

# II. NATIONAL AND SPECIAL RESEARCH PROGRAMS

National and Special Research Programs of the Foundation are major efforts of research or research support of such broad scope that extensive coordination of planning, management, funding, and logistics is essential to effective program performance. These programs may be characterized by inclusion of one or more of the following elements: international cooperation, coordination with other agencies of Government, a relationship to a specific geographic region, or interdisciplinary scientific investigations.

Except where otherwise noted, programs described in this chapter are administered by the Assistant Director for National and International Programs.

## International Biological Program

The National Science Foundation awards grants to support research projects that are part of the U.S. participation in the International Biological Program (IBP). The theme of IBP is the study of "the biological basis of productivity and human welfare," and the major portion of the program is in the area of ecosystem analysis.

The International Biological Program was proposed by the International Council of Scientific Unions in 1964; there are 55 nations now participating in the program. The U.S. National Committee for the International Biological Program, established by the National Academy of Sciences-National Research Council, assists in planning U.S. participation in IBP.

### Eligibility

Appropriateness of projects for consideration by the Foundation under the U.S. IBP research program is determined by the U.S. National Committee for IBP, National Academy of Sciences, 2101 Constitution Avenue, N.W., Washington, D.C. 20418. Scientists who wish to become affiliated with an IBP research program should address an inquiry to the Academy prior to the preparation of a formal proposal.

Before submitting a research proposal the brochure **Grants for Scientific Research** should be consulted. The Foundation does not provide standard application forms for research proposals.

Institutions are required to share in the cost of each unsolicited research project supported by an NSF research grant; this may be accomplished by a contribution to any cost element in the project, direct or indirect.

### Deadlines

Proposals may be submitted at any time; approximately 6 months are required for consideration of a proposal. Grants are normally made for periods up to 24 months.

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*Additional Information*

Communications may be addressed to: Division of Biological and Medical Sciences, National Science Foundation, Washington, D.C. 20550.

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This program is administered by the office of the Assistant Director for Research.

## Global Atmospheric Research Program (GARP)

The National Science Foundation awards grants to support research projects which involve the general circulation of the atmosphere and the physical basis of climate. Such research may improve the capacity of long-range weather prediction, and explore the feasibility of large-scale weather and climate modification.

The Global Atmospheric Research Program (GARP) is a long-term commitment by many nations. Within the United States, by formal agreement among Federal agencies, the Foundation is the primary agency for the support of non-Federal research in the program, particularly at universities. The Department of Commerce is the primary agency for Federal activities.

Grants are normally made for periods up to 24 months. Projects of high scientific merit may be approved scientifically for periods up to 60 months, and will be funded on an annual basis for the term of the approval, contingent upon the availability of funds and the scientific progress of the research.

### Eligibility

Institutions eligible to submit proposals under GARP are colleges and universities; nonacademic, nonprofit organizations; and individual scientists. Occasionally NSF sponsors supporting efforts by other Government agencies, particularly for field programs. Institutions are required to share in the cost of their research projects supported by an NSF research grant; this may be accomplished by a contribution to any cost element in the project, direct or indirect.

Before submitting a research proposal, the NSF brochure **Grants for Scientific Research,** available from the Foundation, should be consulted. The Foundation does not provide standard application forms for research proposals.

### Deadlines

Proposals may be submitted at any time; approximately 3 months are required for consideration of a proposal.

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*Additional Information*

Communications may be addressed to: Division of Environmental Sciences, National Science Foundation, Washington, D.C. 20550.

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This program is administered by the office of the Assistant Director for Research.



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## International Decade of Ocean Exploration

In support of the International Decade of Ocean Exploration (IDOE), the National Science Foundation awards grants and contracts for cooperative programs of ocean research and exploration with emphasis on environmental quality, environmental forecasting, seabed assessment, and living resources. The program supports a relatively small number of research projects which concentrate on broad scientific problems especially susceptible to concerted effort by the research community. Emphasis is placed upon scientific excellance and applicability of results. The Decade is unique in that it brings major efforts to bear on globally planned and coordinated studies of the ocean as a system.

The long-range goals of the Decade are:

(1) to preserve the ocean environment by accelerating scientific observation of the natural state of the ocean and its interactions with the continental margins;

(2) to develop and improve an ocean forecasting and monitoring system, to facilitate prediction of oceanographic and atmospheric conditions, and to reduce hazards to life and property and permit more effective use of marine resources;

(3) to expand seabed assessment activities, to permit better management of ocean mineral exploration and exploitation;

(4) to improve worldwide oceanographic data exchange; and

(5) to increase opportunities for international sharing of responsibilities and costs for ocean exploration and assure better use of limited exploration resources.

The U.S. national program and other nations' IDOE programs are coordinated closely with the Long-Term and Expanded Program of Oceanic Exploration and Research of the Intergovernmental Oceanographic Commission of UNESCO. IDOE is identified as 'an important element' of this program.

### Eligibility

Guidelines on eligibility, programs, and proposal preparation are contained in the NSF publication **International Decade of Ocean Exploration—A Guide to the Preparation of Proposals,** which may be obtained from the Foundation.

### Deadlines

Proposals may be submitted at any time.

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*Additional Information*

Communications may be addressed to: Office for the International Decade of Ocean Exploration, National Science Foundation, Washington, D.C. 20550.

## Arctic Research Program

In fiscal year 1971, as a result of the designation of the National Science Foundation as lead agency for the extension of Federal research in the Arctic, an Arctic Research Program was initiated to provide support for academic research and to coordinate the Foundation program with other agency programs.

This program has four objectives: (1) to increase man's knowledge of the arctic environment and its dynamic parameters and to make intelligent use of the resources of the region; (2) to provide increased coordination of the arctic research programs of the Federal agencies; (3) to increase cooperation in research with other nations having arctic interests; and (4) to develop mechanisms for the exchange of scientific data and research plans, nationally and internationally.

Within the Arctic Research Program there are seven areas of concentration: (1) marine research, including the polar pack ice; (2) terrestrial biology, including analysis of the ecosystem; (3) Man in the Arctic; (4) atmospheric science, which includes solar terrestrial physics; (5) glaciology, including permafrost; (6) geology and geophysics; and (7) information services.

The Foundation has in the past supported activities in the Arctic region through grants and contracts awarded by existing program elements of various offices and divisions. These programs will continue to support such activities.

Coordination of Federal agency research is accomplished through the Interagency Arctic Research Coordinating Committee (IARCC), which is composed of representatives of the 13 agencies sponsoring research in the Arctic or near-Arctic and chaired by the National Science Foundation.

### Eligibility

Universities, colleges, and academically related nonprofit research organizations may submit proposals for grants or contracts for research project support. Occasionally, other types of organizations are supported.

Because of far-reaching scientific, logistic, and international implications of arctic research, it is essential that scientists discuss their plans with the Office of Polar Programs before submitting formal proposals. Proposers also should consult the Foundation's brochure **Grants for Scientific Research.** The Foundation does not provide standard application forms for proposals.

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*Additional Information*

Communications may be addressed to: Office of Polar Programs, National Science Foundation, Washington, D.C. 20550.

## U.S. Antarctic Research Program

The National Science Foundation awards grants or contracts to support field research in Antarctica and to support study of resulting specimens or data in the United States.

Administered entirely by the Foundation, the U.S. Antarctic Research Program supports projects in all relevant sciences—including human behavior, biology, cartography, geology, glaciology, meteorology, oceanography, solid-earth geophysics, and upper atmosphere physics.

After continuous work since the 1957-58 International Geophysical Year, an initial survey of the continent and its surrounding seas is nearing completion. Now, large, complex projects—usually interdisciplinary and frequently international—are under way to investigate specific processes, many of which have global relevance: drilling into bedrock to retrieve the continent's first deep rock cores, mounting a massive four-nation project that will lead to understanding of the mass budget of the entire ice cap, determining with increasing precision the living resources of the southern ocean, measuring worldwide pollution levels, and working toward the ability to predict long-range changes in global climate.

Field research can be carried out year-round at U.S. stations in the Antarctic Peninsula, in Ellsworth Land, on Ross Island, and at the geographic South Pole. During the austral summer, ski-equipped U.S. Navy-operated planes give frequent service to the interior stations, and temporary camps may be established anywhere. The Foundation's 125-foot ship *Hero* supplements research in the Antarctic Peninsula; and research often is carried out in pack ice aboard U.S. Coast Guard icebreakers.

Stateside support is given as required for science information activities, including an ongoing bibliography and a sorting center for specimens. The Foundation publishes the bimonthly *Antarctic Journal of the United States* (U.S. Government Printing Office, $6.50 per year, $8.25 foreign) to report field activities, preliminary findings, and trends in the program.

### Eligibility

Universities, colleges, and academically related nonprofit research organizations may submit proposals for grants or contracts for research project support. Occasionally, support is given to other types of organizations. Institutions are required to share in the cost of projects, which normally are funded for 1 year but under certain circumstances may be funded for up to 5 years. Multiyear projects of high scientific merit may be given assurance of support for the full term of the project, contingent upon availability of funds and scientific progress.

Because of far-reaching scientific, logistic, and international implications of every antarctic research project, it is essential that scientists request further information from the Office of Polar Programs before submitting formal proposals. Proposers also should consult the Foundation's brochure **Grants for Scientific Research.** The Foundation does not provide standard application forms for proposals.

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*Additional Information*

Communications may be addressed to: Office of Polar Programs, National Science Foundation, Washington, D.C. 20550.

## Oceanographic Facilities and Support

The National Science Foundation awards grants or contracts for support of construction, modification, conversion, purchase, and operation of oceanographic facilities which lend themselves to shared usage. Community arrangements for shared use of these facilities have been developed under the University National Oceanographic Laboratory System (UNOLS).

Facilities supported under this program are those required for research both in the open oceans and in the near-shore seas, in estuaries, and on the Great Lakes. Examples of such facilities are ships, boats, submersibles, aircraft, piers, shipboard and shore-related computing capability, environmental simulation units, equipment development capabilities, and new developments for marine environment studies.

The Foundation encourages local contributions from non-Federal funds whenever possible; however, there is no fixed requirement as to the amount of funds that institutions must contribute.

Before submitting a proposal for support under this program, institutions should seek advice from the Office for Oceanographic Facilities and Support (OFS). Specific formats and instructions are available for certain program activities, such as ship operations support, shipboard technician support, and support of capital equipment.

### Eligibility

The general objective of OFS is to provide support for large and expensive oceanographic facilities in accordance with the demonstrated needs of the total academic oceanographic community. Access to NSF-funded facilities will be assured to qualified users through UNOLS.

Institutions qualifying to operate shared facilities will need to demonstrate the logistic capability to carry out all related tasks. Operator institutions may include colleges and universities.

### Deadlines

Ship operations and shipboard technician proposals are due July 1 each year. Proposals requesting support of other activities may be submitted at any time during the year.

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*Additional Information*

Communications may be addressed to: Office for Oceanographic Facilities and Support, National Science Foundation, Washington, D.C. 20550.

For information concerning UNOLS operations, communications should be addressed to: UNOLS Staff Officer, Woods Hole Oceanographic Institution, Woods Hole, Mass. 02543.

## Ocean Sediment Coring Program

The National Science Foundation sponsors the acquisition of material taken from the floor of the deep ocean basins by means of rotary drilling and coring into the sedimentary layer with short penetrations into the underlying crystalline rocks. Samples of the core material are made available to qualified scientists for individual research projects.

The major activity under the program is known as the Deep Sea Drilling Project, managed by the Scripps Institution of Oceanography of the University of California, San Diego. The drilling and coring operations are performed aboard the ship *Glomar Challenger*. About 65 deep ocean sites are occupied per year, yielding about 20,000 linear feet of 2½-inch-diameter cores. Drill sites have been located in water depths exceeding 20,000 feet, and sub-bottom penetrations of more than 4,200 feet have been achieved. Since August 1968, over 350 holes have been drilled and cored at about 250 sites in the Atlantic, Pacific, and Indian Oceans; the Mediterranean, Caribbean, Bering, and Red Seas; and the Gulf of Mexico. Operations are continuing and plans include drilling near Antarctica.

About 10 to 12 scientists participate aboard the drilling ship for each 2-month cruise, describing the cores lithologically and paleontologically as they come on board. These descriptions and resulting interpretations, along with those from shore-based laboratories, are published in a series of volumes—*Initial Reports of the Deep Sea Drilling Project*, one volume for each cruise. The volumes are placed with all major libraries, and are available for purchase by individuals from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Samples of core material for detailed analysis are available to qualified scientists throughout the world a year after the completion of the cruise that collected the cores.

### Eligibility

Proposals for grants for studies of the core material may be submitted by academic institutions, nonprofit organizations, and individual scientists.

### Deadlines

Proposals may be submitted at any time. Approximately 6 months are required to consider a proposal.

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*Additional Information*

Suggestions for scientific planning, including sites to be included on the drilling itinerary, may be addressed to: Manager, Deep Sea Drilling Project, Scripps Institution of Oceanography, University of California, San Diego, Calif. 92037.

Requests for samples of the core material may be directed to: Curator, Deep Sea Drilling Project, address as above.

Scientists interested in participating aboard the drilling ship may write to: Chief Scientist, Deep Sea Drilling Project, address as above.

# III. RESEARCH APPLICATIONS

## Research Applications

During recent years, the National Science Foundation has developed improved capabilities to stimulate research efforts more immediately and directly related to problems of society and the environment.

The problems, challenges, and opportunities to which the scientific community must respond require careful and objective analysis, expansion of the pool of directly relevant knowledge, and considered efforts to make this knowledge available to interested users. Specific needs of the nation provide the basis for program objectives and organization and management of the research supported under these programs. The principal program efforts included under Research Applications are presented under the collective heading Research Applied to National Needs (RANN). The major coordinated research programs administered under RANN are Environmental Systems and Resources, Social Systems and Human Resources, Advanced Technology Applications, and Exploratory Research and Problem Assessment. An additional element is comprised of the Intergovernmental Science and Research Utilization Programs, also included in the program descriptions on the following pages.

Institutions are required to share in the cost of each unsolicited research project supported by an NSF award, this may be accomplished in accordance with the institution's cost-sharing practices. Before submitting a proposal for research support, descriptive brochures on the RANN Program and the Intergovernmental Science and Research Utilization Programs should be consulted.

The following criteria were utilized in developing the ongoing major coordinated research efforts of RANN, and are used in selecting additional projects:

- **Importance**—Where the significance and urgency of the problem area or the potential consequences for the nations are great;
- **Payoff**--Where domestic, economic, and social benefits to be realized are significantly higher than the anticipated research and implementation costs, or where the potential to strengthen the U.S. position internationally exists;
- **Leverage**—Where science and technology can have a unique and substantial impact on the problem;
- **Readiness**—Where the effort is timely and scientifically ready and the skilled manpower is available;
- **Capability**—Where Federal, academic, and industrial capabilities exist to mount a successful research program;
- **Need for Federal Action**—Where the research is not being conducted by private industry because the immediate incentive is not sufficient or the market is fragmented;
- **Unique position of NSF**—Where the NSF can most effectively serve the research needs of the Government.

### Eligibility

Proposals may be submitted by colleges, universities, and profit and nonprofit organizations, including State and local governments. These proposals may provide for collaborative arrangements with other universities, nonprofit and/or profit-making organizations.

### Deadlines

Proposals may be submitted at any time, and should first be submitted in preliminary form for negotiation and discussion. Approximately 3 to 6 months are required for consideration of proposals. Proposals requesting renewal support should be submitted at least 6 months in advance of the anticipated termination date of the existing grant in order to assure uninterrupted support.

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*Additional information*

The publication **Research Applied to National Needs** describes guidelines for proposal preparation to the RANN Program.

Communications may be addressed to the appropriate division or office: Division of Environmental Systems and Resources, Division of Sccial Systems and Human Resources, Division of Advanced Technology Applications, Offi e of Exploratory Research and Problem Assessment, or Office of Intergovernmental Science and Research Utilization, National Science Foundation, Washington, D.C. 20550.



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## Advanced Technology Applications

The principal goals of the Division of Advanced Technology Applications are to support technological research that contributes to the national economy and productivity, reduces the adverse economic and societal costs of destructive natural phenomena, reduces the adverse impacts of technology on society and the environment, and improves the quality of community life.

### Disaster and Natural Hazard Research

The subprograms are Earthquake Engineering and Fire Research. The natural hazards to be considered are primarily dynamic in nature and include: earthquake, wind (tornadoes, hurricanes), tsunami and wind-induced waves, landslide, flood, drought, and unwanted fire.

*Earthquake Engineering.* There are eight basic task areas for earthquake engineering research activity: (1) socioeconomic effects and costs; (2) ground motion instrumentation and measurements; (3) effects on soils and foundations; (4) dynamic analysis of structures; (5) detailed fabrication of structures; (6) tsunami (earthquake-caused tidal waves)—observation and protection; (7) design and distributional aspects of public services and utilities; and (8) post-earthquake inspection and engineering evaluation. These areas, while not separable in any sense, represent areas of concentration with high potential benefits relative to expenditure.

*Fire Research.* The following objectives indicate the scope of the research:

- Increase the basic kno[illegible]e on the mechanisms of ignition an[illegible]e spread.
- Study specific classes [illegible] materials, particularly new materials, for burning and the products of combustion.
- Obtain basic information on fabric flammability and associated hazards leading toward the setting of standards.
- Study flame spread mechanisms in structures.
- Develop models of flame spread.
- Develop knowledge of the mechanisms of flame suppressants.
- Seek improved means for fire detection, alarm, and control.

### Technological Needs and Opportunities

Support may be provided for research activities that represent technological opportunities, such as enzyme technology, instrumentation technology, excavation technology, and advanced industrial processing.

*Enzyme Technology.* The purpose of the Enzyme Technology Program is to stimulate the development of the engineering and technology required to facilitate increased industrial uses of enzymes. The program will support the development of uses of enzymes. The research involved will relate as closely as possible to those enzymes which have the potential for industrial importance. The objectives of this program include:

- Advancement of fermentation and cell culture technology for the production of enzymes.
- Advancement of technology for the isolation and purification of dissolved enzymes and of particle-bound enzymes.
- Advancement of technology of enzyme reaction systems using free and/or immobilized enzymes.
- Development and/or preliminary economic evaluation of new applications of enzymes.

*Excavation Technology.* The following areas are appropriate for research: (1) site investigation; (2) excavation material investigation; (3) ground support and tunnel lining technology; (4) systems technology and testing; (5) systems analysis and investigation; (6) excavation technology; (7) education and information dissemination; (8) testing and evaluation of cavity stability; (9) economic

factors; (10) legal and institutional factors; and (11) material handling technology.

*Instrumentation Technology.* The purpose of this program is to support research projects leading to new uses and improvements of instrumentation for environmental, social, and technological systems.

The objectives of this program are to:

- Adapt and expand the uses of existing instrumentation and methodologies for new applications, e.g., particle accelerators for detection of trace elements for use in environmental monitoring.
- Develop new research instrumentation that can extend the range or accuracy of measurement of control for existing applications, e.g., mono-energetic X-ray radiography for improved services to society.
- Utilize scientific or engineering principles to develop new instrumentation capabilities and improved methods of measurement and control, e.g., infrared laser radiation for gas analysis for use in environmental monitoring.
- Seek understandings of new scientific and engineering principles that can lead to new substantial additional capabilities in instrumentation applications, e.g., negative pion therapy for improved services to society.

*Advanced Industrial Processing.* This program focuses upon those technologies expected to have an immediate benefit in the areas of materials processing and extractive metallurgy.

## Energy Research and Technology

The three general objectives in energy research and technology are to sponsor research on:

- Analysis of future, intermediate, and long-range needs and various strategies for meeting these needs.
- Environmental, economic, and social impacts of energy production, and use and means for assessing and ameliorating detrimental impacts.
- Neglected or otherwise underexploited technologies which have possible major impact on the energy problem but no present appropriate sponsor.

Specific areas of emphasis include:

- Solar Energy
- Energy Systems
- Energy Resources
- Energy Conversion
- Energy Transmission Systems

## Environmental Systems and Resources

The programs of this division develop scientific data and strategic frameworks to deal with environmental problems, including the complex tradeoffs between economic and social development and environmental quality.

Research supported under these programs deals specifically with establishing baselines of environmental quality, long-range environmental management strategies, the environmental consequences of modern technology, resource exploitation, and procedures for resource recycling.

### Weather Modification

The overall purpose of the Weather Modification Program is to study those atmospheric mechanisms which can be or are being influenced by man to modify natural weather patterns and evaluate the impact of their modification upon society.

The specific objectives may be defined as follows:

- Develop a level of understanding of the mechanisms of hail formation in severe convective storms which will lead to a more reliable method of hail suppression.
- Develop a more adequate knowledge of the ice nucleation mechanism in the atmosphere which will result in a capability to measure and predict the consequences of a seeding operation.
- Develop a more adequate knowledge of how atmospheric pollutants may influence weather patterns through the modification of natural meteorological processes.
- Develop new concepts and models of the atmosphere which will result in greater operational capabilities or increased efficiency in weather modification techniques.
- Increase our understanding of the social, economic, legal, and ecological impact of operational weather modification practices upon society.

### Environmental Aspects of Trace Contaminants

This program is designed to develop an understanding of the impact on man and the environment of many known and potential environmental trace contaminants, such as manufacturing byproducts, agricultural and household wastes, oil and hazardous materials spillage and dissipation, and elements of the bio-geochemical environment for the purpose of understanding and control. Specific objectives are:

- Identify the trace contaminants (and magnitude of their release into the environment) resulting from natural processes, agricultural and mining practices, and the manufacture, use, and disposal of products and byproducts.
- Develop techniques in analytical chemistry, data on biota highly sensitive to pollutants, and knowledge of pollutant-concentrating mechanisms in food chains.
- Identify the environmental sources and sinks, routes, and rates of flow of trace contaminants.
- Identify the targets, including man, in the routes of flow, and assess the degree of damage to these targets.
- Synthesize models of environmental systems which define trace contaminant transport (mass flux), predict causes and effects, and alternative actions for contaminant control.
- Identify the changes in molecular species which trace contaminants undergo in their movement through environmental media.
- Identify the legal and economic factors which impede or assist environmental pollution by trace contaminants, and assess their impact.
- Identify costs and benefits of alternative abatement strategies.
- Provide data that assist Federal and other

governmental regulatory agencies in setting realistic and fair environmental standards.

- Provide information useful to local and regional decision-makers in planning further use of land, water, and air resources for habitation, recreation, and commerce, including information on environmental decontamination.

## Regional Environmental Systems

The purpose of this program is to study regional environments and resources in order to establish the scientific basis for their management and use. A major aim of the Regional Environmental Systems Program is the enhancement of man's capacity to select from the universe of development and management strategies those which most effectively achieve environmental quality objectives within the context of other societal goals.

Objectives of the program are:

- Define environmental problems, including those unique to a particular region and those common to many regions.
- Identify resources impacted and ecosystem relations to predict consequences of alternative schemes to correct environmental problems.
- Assess environmental preferences and determine those factors which influence perceptions and attitudes toward—and willingness to pay for—various resource mixes and levels of environmental quality.
- Evaluate economic and legal mechanisms as management options available to decision-makers, the specific environmental effects of these options, and the potentially detrimental effects of other forms of public policy.
- Synthesize management schemes utilizing the necessary environmental, economic, and social information.
- Evaluate management schemes in relation to other policies designed to meet other societal objectives.

Significant environmental problems may be viewed as either issue-centered or region-centered. In either case, the current state of understanding of environmental systems is rudimentary, yet the problems may be quite pressing. Efficient and effective realization of coordinated interdisciplinary research which contributes to management strategies is essential.

## Social Systems and Human Resources

The Division of Social Systems and Human Resources has two major objectives. The first is to fill needs for policy-relevant research on major social problems. Policy-relevant is defined as research that could make a direct and significant difference in the choices made by national, State, or local decision-makers or that helps clarify and resolve debate on social policy. The second objective is to advance the state-of-the-art in social policy analysis. Quite frequently, well-intentioned social policies fail or even have adverse consequences because the analytic methods used were not powerful enough to generate the information or predictions required for sensible decision-making.

Programs of the division are:

### Municipal Systems, Operations, and Services

The objectives of this program are:

- Improve the use of existing resources and the effectiveness of municipal governments in delivering public goods and services.
- Evaluate the social effects of new urban technology and investigate the ways in which social and technical systems can best be fitted together.
- Evaluate the benefits and costs of alternative Federal, State, and local mechanisms for coping with problems of municipal governments.

The following areas have been selected for special emphasis:

- Identify the benefit-costs of alternative forms for the delivery of municipal goods and services.
- Identify cost-effective changes in criminal justice systems.
- Conduct socioeconomic evaluations of new communications technology.
- Identify and analyze impact of innovations in urban transportation.
- Identify alternative Federal, State, and local relationships.

### Social Data and Community Structure

The objectives of this program are:

- Provide information and analyses required for the development and evaluation of social programs and policies.
- Improve the capabilities of Federal, State, and local governments to design, implement, and evaluate social programs.

Areas selected for special emphasis are:

- Community and population structure work focused on creating baseline descriptions of the socioeconomic structure of American communities and of the American population. Baselines on populations are necessary to provide a standard for comparing the effects of alternative policies. Surveys and analyses of the effectiveness of survey delivery organizations are also carried out.
- Improving social data utilization—This research examines the factors that influence the demand for and the supply of applied social research and policy research and the approaches and methods used. In addition, the communications between researchers and user are analyzed and methods suggested to make this communication more effective.
- Evaluation techniques for social programs—Research is conducted on the use of evaluations and social experiments in setting priorities for future social programs and on comparing and analyzing the experience of Government agencies in conducting social experiments.
- Law, science, and technology— Research is directed to participants in the legal system who are responsible for its efficient and equitable functioning and decision-making. This includes particularly the courts, administrative agencies, regulatory agencies, legislatures and their staffs, and the practicing bar.

## Exploratory Research and Problem Assessment

This program supports exploratory research and assessment projects to determine which national problems may be amenable to amelioration through the application of science and engineering capabilities. Assessments will help to define the role of science in dealing with societal problems and will also examine the impact of science and technology on society. Principal goals are: to define adequately the broad context of particular societal problems; and to identify those research opportunities and strategies which are critical to dealing with the problems. In this way, new areas of potential research investment for RANN or other agencies can be identified and the prospects for a more extensive program assessed. Major components of the program are:

### Problem Definition and Assessment

*Problem Definition.* Defining and analyzing national issues in a broad context to synthesize existing knowledge and identify specific opportunities for research to assist decision-makers.

*Problem Assessment.* Setting societal problems in a broad context through synthesizing existing knowledge and delineating specific avenues of research potentially useful for clarifying public issues and for decision-making processes.

*Technology Assessment.* Exploring the impacts of present or proposed applications of science and technology in order to illuminate public policy alternatives.

### Exploratory Research

Supporting early stages of research in areas not yet well enough defined or understood to merit full programmatic support; this includes research into the impact of science and technology on public policy issues, and consideration of the utility of further research and the merits of a concerted programmatic effort.

Problem definition and assessment studies extend across the full range of national and social issues. Exploratory research is limited to areas which have been identified as gaps in Federal and private research activity, which have high potential payoff for the nation, and which otherwise satisfy the general RANN criteria.

The range and type of problem areas planned for this research program include:

*Technology and the Economy.* Exploring the interfaces of technology and the economy where the Government has a unique role or opportunity to stimulate and influence qualitative and quantitative socioeconomic change. Specific program areas include: Internalization of Social Costs; Consumer and the Marketplace; Impacts of Large Civil Works; Innovation in the Private Sector; Computerization, Automation, Robotics, and Productivity (including service sector); Automotives: Man and the Automobile; and Traffic Flow and Transportation.

*Human Needs.* Exploring opportunities and problems engendered by life in our highly technological society through examination of such areas as alternative population patterns, rehabilitation potentials, the roles of different societal groups, and modified social services. Specific program areas include: Consequences of Alternative Population Patterns; Human Rehabilitation—Physical, Mental, Social; Women, the Young, the Family; Education for a Continually Changing Society; Societal Implications of an Aging Population; Work and Leisure; Reform and Modernization of Civil Law and Institutions; Law and Technology; and Minority Groups.

*Alternative Futures and Institutional Innovation.* Dealing with the systemic difficulties of: the inadequacy or absence of long-range planning; the tendency to discount the future; the penchant for treating symptoms rather than causes; and the sluggishness of institutional

response. Specific program areas include: Long-Range Planning in the Public and Private Sectors—Forecasting Methods and Techniques; Interrelationship Between Scientific and Technological Alternatives and Policy Options; New Institutions and Institutional Responsiveness; and Voluntarism.

*Other Societal Problems.* Providing needed assessment and exploratory research in response to creative, innovative ideas and approaches, where the societal problem satisfies the general RANN criteria but falls outside of the above-defined areas or the programs of RANN.

## Intergovernmental Science Programs

The National Science Foundation awards grants to enable State and local levels of government to develop new and improved programs and institutions for the systematic application of science and technology to governmental problems, and for the utilization of research resulting from NSF applied research programs.

Objectives of the Intergovernmental Science Programs are:

(1) Advance the understanding of public issues and problems having scientific and technological content at the State and local levels of government and to assess needs and opportunities for more effective application of science and technology;

(2) Demonstrate innovative science and technology planning and decision-making processes related to State, local, and regional problems;

(3) Stimulate selected State and local government experimentation, on a pilot basis, with science and technology systems in the context of their own needs and resources;

(4) Encourage adoption of new systems which show promise for enhancing State and local ability to incorporate science and technology into public programs;

(5) Improve communication between persons and groups concerned with science and technology at the Federal, State, and local levels of government.

The proposed activity must involve a problem of general interest to State and local governments. Preference will be given to innovative approaches to the development of models for governmental use of science and technology. Activities supported may include development of mechanisms, manpower and education programs (involving State and local government officials), technology assessment and forecasting studies, research utilization and information transfer, and exploratory studies to help develop science and technology-related innovative policies and programs for State and local governments. Institutional support may be provided to assist in establishment of centers for governmentally related science and technology applications. Conferences and seminar projects at the State, regional, and national levels, and projects to collect and analyze data on State and local scientific and technical resources may also be supported.

### Eligibility

Proposals may be submitted by units of State and local governments and their State, regional, or national organizations, legislatures, professional schools, State academies of science, colleges, universities, and nonprofit institutions. Proposals combining academic institutions and units of government will be of particular interest. There is no requirement for matching funds, but normally applicants are required to share in the cost of any proposed activity. Contractual arrangements are made on occasion with profit-making organizations for the performance of work in which they are uniquely qualified.

Proposals may be submitted to other Federal agencies for partial support and to NSF for those activities that fall outside the program scope of other Federal agencies.

### Deadlines

Proposals may be submitted at any time; processing of a proposal requires approximately 6 months. Informal inquiry to the Foundation may be made to determine whether or not a potential project would qualify for support.



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# IV. NATIONAL RESEARCH CENTERS

The National Science Foundation provides support for the development and operation of National Research Centers established to meet national needs for research in specific areas of science requiring facilities, equipment, staffing, and operational support which are beyond the capabilities of private or State institutions and which would not appropriately be provided to a single institution to the exclusion of others. Unlike many federally sponsored research laboratories, the NSF-supported National Research Centers do not perform specific research tasks assigned by or for the direct benefit of the Government. They are established and supported for the purpose of making available, to all qualified scientists, the facilities, equipment, skilled personnel support, and other resources required for the performance of independent research of the scientists' own choosing, in the applicable areas of science.

The Foundation supports four astronomy centers (National Astronomy and Ionosphere Center at Arecibo, Puerto Rico; Cerro Tololo Inter-American Observatory, located near Santiago, Chile; Kitt Peak National Observatory, located at Tucson, Ariz.; and National Radio Astronomy Observatory, located at Green Bank, W. Va.) and one atmospheric research center (National Center for Atmospheric Research, Boulder, Colo.).

The centers are managed by the Office of National Centers and Facilities Operations in the Directorate of National and International Programs. More detailed information on each of these National Research Centers is given on the following pages.

## National Astronomy and Ionosphere Center

The National Science Foundation supports the National Astronomy and Ionosphere Center at Arecibo (Puerto Rico), an independent center for the conduct of radio astronomy, and ionospheric research. The observatory is managed and operated by Cornell University under contract with the Foundation.

The world's largest reflector, a 1,000-foot-diameter spherical fixed telescope, is located at the Arecibo observatory. The immense size of this research instrument has enabled it to make unique and significant contributions to understanding of the earth's atmosphere, the solar system, and radio sources outside of the solar system.

The major objective of the observatory is to make available on a national basis radio and radar facilities that will enable it to contribute significantly to new discoveries in the fields of ionospheric studies, lunar and planetary radar, and radio astronomy.

Future planning for the observatory includes new and important installations. The most important is the upgrading of the present reflector. A new surface will enable the telescope to be operated at wavelengths as short as 4.2 cm., considerably below the present wavelength limit of 50 cm.

Arecibo has a small permanent staff of scientists, engineers, and technicians who are available to assist visiting scientists and observers.

### Eligibility

All qualified U.S. scientists and on occasion foreign visitors may use the instruments, subject to priorities based on the scientific merit of the proposed research, the capability of the instruments to do the work proposed, and the time available.

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*Additional Information*

Communications may be addressed to: Director, National Astronomy and Ionosphere Center, Cornell University, Ithaca, N.Y. 14850.

## Cerro Tololo Inter-American Observatory

The National Science Foundation supports the Cerro Tololo Inter-American Observatory (CTIO), an independent center whose optical telescopes and related facilities are available to all qualified scientists from the United States, Chile, and elsewhere in North and South America. CTIO provides astronomers with the opportunity to observe those parts of the Southern Hemisphere skies that are not visible or not adequately observable from the United States, using telescopes made available by the Federal Government and other organizations.

The Cerro Tololo Observatory is located on a 7,200-foot mountain in the foothills of the Andes Mountains about 300 miles north of Santiago, Chile. The administrative headquarters is in the coastal city of La Serena, about 60 miles away. CTIO is supported under the terms of a contract between the Foundation and the Association of Universities for Research in Astronomy, Inc., which also operates the Kitt Peak National Observatory. Close ties are maintained with the University of Chile.

Major astronomical instruments at Cerro Tololo include 60-inch, 24-inch, 36-inch, two 16-inch telescopes, and a 24-inch Schmidt telescope on long-term loan from the University of Michigan. A 150-inch reflecting telescope is scheduled to be completed in 1974. Cerro Tololo has a small permanent staff of scientists, engineers, and technicians who are available to assist visiting scientists and observers.

### Eligibility

Most of the observing time at Cerro Tololo is used by visiting astronomers. Qualified scientists may use the instruments subject to priorities based on the scientific merit of the proposed research, the capability of the instruments to do the work proposed, and the available time.

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*Additional Information*

Communications may be addressed to: Director, Kitt Peak National Observatory, 950 North Cherry Avenue, Tucson, Ariz. 85717.

## Kitt Peak National Observatory

The National Science Foundation supports the Kitt Peak National Observatory (KPNO), an independent center that makes available optical telescope and associated equipment to qualified scientists.

Headquarters of KPNO is in Tucson, Ariz.; observing facilities are located atop Kitt Peak, about 45 miles southwest of Tucson. KPNO is supported under the terms of a contract between the Foundation and the Association of Universities for Research in Astronomy, Inc.

Major astronomical instruments at Kitt Peak include the world's largest solar telescope of 60-inch aperture; a 50-inch automated reflecting telescope; an 84-inch, two 36-inch, and two 16-inch reflecting telescopes. A 150-inch telescope is scheduled to be completed in 1972. The observatory also maintains a rocket flight program that provides payload integration and launch and recovery services for rocket-borne experiments for research in astronomy, aeronomy, and planetary atmosphere.

KPNO has a staff of resident scientists, engineers, and technicians who are available to assist visiting scientists and observers.

### Eligibility

KPNO makes up to 60 percent of the observing time on each instrument available for the use of visiting scientists. All qualified U.S. scientists and on occasion foreign visitors may use the instruments, subject to priorities based on the scientific merit of the proposed research, the capability of the instruments to do the work, and the available time.

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*Additional Information*

Communications may be addressed to: Director, Kitt Peak National Observatory, 950 North Cherry Avenue, Tucson, Ariz. 85717.

## National Radio Astronomy Observatory

The National Science Foundation supports the National Radio Astronomy Observatory (NRAO), an independent center through which Government-owned radio astronomy facilities are made available to qualified scientists. The NRAO staff assists visiting scientists with the large radio antennas, receivers, and other equipment needed to detect, measure, and identify radio waves from outer space.

Headquarters for NRAO is in Charlottesville, Va.; observing facilities are located primarily in Green Bank, W. Va. NRAO is supported under the terms of a contract between the Foundation and Associated Universities, Inc., a nonprofit corporation.

Major research facilities at NRAO include a 140-foot highly precise, fully steerable radio telescope; an interferometer consisting of three fully steerable 85-foot telescopes with a portable 42-foot telescope for remote operation; and a 300-foot radio telescope steerable in declination (latitude) only. A 36-foot radio telescope operating at millimeter wavelengths is located at the Kitt Peak National Observatory near Tucson, Ariz. NRAO has a small staff of resident scientists, engineers, and technicians

### *Eligibility*

NRAO makes up to 60 percent of the observing time on each instrument available for the use of visiting scientists. All qualified U.S. scientists and on occasion foreign visitors may use the instruments, subject to priorities based on the scientific merit of the proposed research, the capability of the instruments to do the work proposed, and the time available.

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*Additional Information*

Communications may be addressed to: Director, National Radio Astronomy Observatory, Charlottesville, Va. 22901.

## National Center for Atmospheric Research

The National Science Foundation supports the National Center for Atmospheric Research (NCAR), an independent center that serves as a focal point for an expanding national research effort in the atmospheric sciences. NCAR offers support services, fellowships, and research facilities to qualified scientists working in the field of atmospheric research.

Headquarters and major laboratories of NCAR are located in Boulder, Colo. Research activities and operations are worldwide. Support of NCAR is provided under the terms of a contract between the Foundation and the University Corporation for Atmospheric Research, a nonprofit corporation.

Research and facilities programs of NCAR are carried out by four groups: the Laboratory of Atmospheric Sciences (LAS), the High Altitude Observatory (HAO), the Facilities Laboratory, and the Advanced Study Program. LAS is concerned primarily with the earth's atmosphere up to an altitude of about 60 miles. HAO is interested in the sun and the regions between the sun and the earth. Other NCAR facilities available to assist visiting scientists include a National Scientific Balloon Facility at Palestine, Tex., a Computing Facility at Boulder, and an Aviation Facility at Broomfield, Colo.

In addition to conducting its own research programs, NCAR participates in a number of atmospheric research efforts conducted by Government agencies, university scientists, and research groups on a national or international scale. Major efforts include development of computer simulation of atmospheric global circulation patterns and convective cloud processes, measurement of chemical constituents of the atmosphere, theoretical studies and observations of solar-terrestrial phenomena, investigation of the atmospheric conditions responsible for the formation of hailstorms, and development of techniques to abate hail formation. More than 600 scientists, engineers, technicians, and support personnel comprise the NCAR staff.

### Eligibility

Visiting scientists study and conduct research at NCAR under fellowships and research programs. NCAR facilities are available to qualified scientists, subject to scheduling feasibility.

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*Additional Information*

Communications may be addressed to: Director, National Center for Atmospheric Research, P.O. Box 1470, Boulder, Colo. 80302.

# V. INTERNATIONAL COOPERATIVE SCIENTIFIC ACTIVITIES

The Foundation encourages and supports U.S. scientific participation in international science programs and activities that promise maximum benefit to the U.S. science effort.

It is Foundation policy to foster the interchange of information among scientists in the United States and foreign countries, initiate and support scientific activities in connection with matters relating to international cooperation, support basic research abroad (in special cases) as a supplement to the national research effort, and provide support to U.S. institutions for research which is to be conducted abroad.

Programs described in this chapter are administered by the Office of International Programs (OIP) and complement other Foundation activities in support of scientific research and science education. OIP welcomes inquiries about any of the programs listed and encourages U.S. scientists and engineers to discuss with this office plans and new approaches to international cooperation in science.

OIP is a component of the Directorate of National and International Programs.

## United States-Australia Cooperative Science Program

The National Science Foundation coordinates the participation of U.S. scientists, organizations, and agencies in this program under the United States-Australia Agreement for Scientific and Technical Cooperation. The purpose of the agreement is to provide additional opportunities to exchange ideas, information, skills and techniques; to collaborate on problems of mutual interest; to work together in unique environments; and to utilize special facilities. Participating scientists may be in civil agencies of the Government or in academic or other institutions.

Joint activities which further cooperation may include:

(1) Exchange of scientists and technical experts.

(2) Pursuit of joint research activities.

(3) Convocation of joint seminars and workshops.

Funds for the support of the activities of American scientists may come from any U.S. source including the National Science Foundation. Special funds are available from the Foundation for the support of visiting scientists and joint seminars.

Each activity in the program requires approval by the Foundation and by the Commonwealth Department of Education and Science, the executive agencies responsible for carrying out the terms of the agreement in the United States and Australia. Nothing in the agreement is intended to prejudice other arrangements for scientific and technical cooperation between the two countries.

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*Additional Information*

Communications may be addressed to: United States-Australia Cooperative Science Program, Office of International Programs, National Science Foundation, Washington, D.C. 20550.

## United States-Brazil Cooperative Science Program

The National Science Foundation coordinates the participation of U.S. scientists in this program under the United States-Brazil Agreement for Scientific and Technical Cooperation. The Conselho Nacional de Pesquisas acts for the Government of Brazil. The objectives of the program are to promote cooperation in research between scientists of the two countries in certain approved fields through exchange visits, research-focused seminars, and cooperative research projects. The following fields have been approved for the initiation of the program:

- Biology, immunology, and therapeutics of tropical pathogens
- Astronomy
- Pure and applied mathematics (including the computer sciences)
- Materials sciences

Each activity in the program involves participation by scientists of both countries and requires approval by the Foundation and by the Conselho Nacional de Pesquisas. The agreement does not in any way block or prejudice other arrangements for scientific activities involving both countries.

Funds for the support of activities of U.S. scientists under the program may come from any source, including the regular research support programs of the Foundation as well as special funds for this program. Proposals are submitted to the appropriate agency in accordance with normal procedures. In the case of proposals submitted to other agencies, copies should be sent at the same time to the Foundation.

Proposals should be developed jointly with the Brazilian scientists who will be collaborating in the activities.

### Eligibility

Individual scientists who are members of the U.S. scientific community may apply directly for support of travel to Brazil or through their institutions for the support of cooperative research projects.

### Deadlines

No deadlines have been established for fiscal year 1973. Applications for travel support should be submitted to the Foundation at least 2 months in advance.

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*Additional Information*

Communications may be addressed to: United States-Brazil Cooperative Science Program, Office of International Programs, National Science Foundation, Washington, D.C. 20550.

# United States-Republic of China Cooperative Science Program

The National Science Foundation awards grants to support the participation of U.S. scientists in the United States-Republic of China Cooperative Science Program. Chinese funds support Chinese scientists participating in the program.

Three types of projects are supported in the program:

(1) Cooperative research in all areas of the natural sciences.

(2) Visiting scientists.

(3) Scientific seminars.

A brochure describing the United States-Republic of China Cooperative Science Program is available from the Foundation, together with guidelines for submitting proposals.

## Eligibility

Those eligible to submit proposals are colleges and universities, individual scientists, or groups of scientists. The program is aimed primarily at the academic scientists; however, others may be considered. An informal inquiry to the Foundation should be made before a formal proposal is submitted. All projects involving both United States and Chinese scientists are jointly funded and must be approved by the Foundation and the National Science Council in Taipei.

## Deadlines

Proposals may be submitted at any time; approximately 6 months are needed for consideration.

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*Additional Information*

Communications may be addressed to: United States-Republic of China Cooperative Science Program, Office of International Programs, National Science Foundation, Washington, D.C. 20550.

## East Europe Cooperative Science Programs: Romania, Hungary, Czechoslovakia, Bulgaria

These programs are offered to foster and support scientific and technological cooperation on a bilateral basis between the United States and each of the cooperating countries. The programs are conducted and coordinated between the National Science Foundation and the National Council for Science and Technology of Romania, the Institute for Cultural Relations of Hungary, the Czechoslovak Academy of Sciences, and the Bulgarian Academy of Sciences.

Under these programs, research-oriented cooperative activities may be conducted and supported in any branch of science and technology, including basic and applied aspects of the natural sciences and mathematics, the engineering sciences, and the social sciences, and including interdisciplinary or problem-oriented areas. Support is offered for three types of activities:

(1) **Cooperative research**—projects designed jointly by, and to be conducted collaboratively between, a principal investigator of the United States and a principal investigator of the cooperating foreign country. Proposals are submitted by an American institution to the National Science Foundation and by the institution of a foreign investigator to the coordinating agency in his country.

(2) **Seminars**—meetings of small groups of scientists of the United States and of the foreign country, jointly designed and convened by American and foreign co-organizers. A seminar may be held in the United States or in the cooperating foreign country. Proposals are submitted by the American co-organizer or his institution to the National Science Foundation and by the foreign co-organizer through his institution to the coordinating agency in his country.

(3) **Scientific visits**—visits of short duration for the purpose of planning cooperative scientific activities or conferring about cooperative scientific activities; also, with Romania, visits of longer duration for purposes of research, study, or lecturing. The application of an American scientist to visit one or more of the cooperating countries is submitted by him to the National Science Foundation; the application of a foreign scientist to visit the United States is submitted by him or by his institution to the coordinating agency in his own country.

### Eligibility

American institutions eligible to participate in these programs include universities and colleges, professional societies, academies of sciences, and other nonprofit scientific organizations of the private or public sectors. Support is available for American scientists who are U.S. citizens or who have at least 5 years of professional employment beyond the doctorate in U.S. institutions and are currently affiliated with an eligible U.S. institution. American scientists employed by profit-making organizations are not eligible for support.

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*Additional Information*

The brochure **Cooperative Science Programs: Romania, Hungary, Czechoslovakia, Bulgaria; Cooperative Research, Joint Seminars, Scientific Visits** is available from the Foundation.

Communications may be addressed to: East Europe Cooperative Science Programs, Office of International Programs, National Science Foundation, Washington, D.C. 20550.

## United States-France Exchange of Scientists Program

The National Science Foundation and the Centre National de la Recherche Scientifique jointly sponsor an exchange of scientists for study or research in the mathematical, physical, chemical, engineering, and social sciences and in the biological sciences exclusive of the medical sciences. Awards are not made in the medical sciences or in education or business fields.

### Eligibility

Eligible individuals are citizens or nationals of the United States and France who will have earned a doctoral degree or its equivalent normally not more than 5 years prior to the commencement of the exchange visit. Eligible institutions are, for American candidates, any appropriate nonprofit French institution. Appropriate nonprofit institutions are institutions of higher education; government research institutes, laboratories, or centers; and privately sponsored nonprofit institutes. The period of the exchange visit is normally between 5 and 15 months. French candidates may obtain information and application materials from the Centre National de la Recherche Scientifique. American candidates may obtain information and application materials from the address below.

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*Additional Information*

Communications may be addressed to: United States-France Exchange of Scientists Program, Office of International Programs, National Science Foundation, Washington, D.C. 20550.

## United States-India Exchange of Scientists Program

The National Science Foundation administers the participation of U.S. scientists and engineers in a program of short-term exchanges with India for the purpose of exchanging scientific information and planning future scientific cooperation. In India the program is administered by the Council of Scientific and Industrial Research. These organizations are jointly responsible for approving each exchange visit. The National Science Foundation pays only travel costs of U.S. scientists to and from India. Within India, expenses are covered by the local hosts. A brochure describing this program is available from the Foundation.

### Eligibility

Individual senior scientists and engineers are eligible to submit proposals. The evaluation of requests is based on the applicant's professional qualifications and the merit of the proposed activity in India.

### Deadlines

Proposals may be submitted at any time.

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*Additional Information*

Communications may be addressed to: United States-India Exchange of Scientists, Office of International Programs, National Science Foundation, Washington, D.C. 20550.

## United States-Italy Cooperative Science Program

The National Science Foundation coordinates the participation of U.S. scientists and institutions in the United States-Italy Cooperative Science Program.

The objectives of the program are to promote cooperation between scientists of the two countries for peaceful purposes and to provide additional opportunities for them to exchange ideas, skills, and techniques; to attack problems of particular mutual interest; to work together in unique environments; and to utilize special facilities.

Types of projects included in this program are:

(1) Joint research projects.

(2) Exchange of scientists, in connection with approved projects.

(3) Seminars to exchange information and plan cooperative research.

Each activity in the program involves participation by scientists of both countries and requires approval by the Foundation and by the Consiglio Nazionale delle Ricerche, the executive agencies responsible for carrying out the terms of the agreement in the United States and Italy. Nothing in the agreement is intended to prejudice other arrangements for scientific cooperation between the two countries.

Funds for the support of the activities of American scientists may come from any U.S. source, which includes but is not confined to the regular research support programs of the Foundation. Proposals are submitted to the appropriate funding agency or institution in accordance with its normal procedures. At the same time, the U.S. investigator sends a copy of his proposal to the address below, together with a copy of the joint application form, signed by him and the Italian principal investigator. A brochure describing the United States-Italy Cooperative Science Program is available from the Foundation, together with instructions and guidelines for submitting proposals.

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*Additional Information*

Communications may be addressed to: United States-Italy Cooperative Science Program, Office of International Programs, National Science Foundation, Washington, D.C. 20550.

## United States-Japan Cooperative Science Program

The National Science Foundation awards grants to support the participation of U.S. scientists in the United States-Japan Cooperative Science Program. Japanese funds support Japanese scientists participating in the program.

Three types of projects are included in the program:

(1) Cooperative research in all areas of the natural sciences.

(2) Scientific seminars.

(3) Visiting scientists

A brochure describing the United States-Japan Cooperative Science Program is available from the Foundation, together with guidelines for submitting proposals.

### Eligibility

Those eligible to submit proposals are colleges and universities, nonprofit research institutions, individual scientists, or groups of scientists. The program is aimed primarily at the academic scientist; however, others may be considered. All projects involving both United States and Japanese scientists are jointly funded and must be approved both by the Foundation and the Japan Society for the Promotion of Science.

### Deadlines

Proposals may be submitted at any time; approximately 6 months are needed to consider a proposal.

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*Additional Information*

Communications may be addressed to: United States-Japan Cooperative Science Program, Office of International Programs, National Science Foundation, Washington, D.C. 20550.

## Scientists and Engineers in Economic Development Program

The National Science Foundation, through a special program funded by the Agency for International Development (AID), will provide support for individual U.S. scientists and engineers to apply their experience to problems of development in 39 countries currently receiving assistance from AID.

The program's objectives are to enable U.S. scientists and engineers to share experiences with their counterparts in developing countries who formulate and conduct specific research and education programs contributing in a direct way to economic development in their countries; establish long-term collaborative relationships between U.S. and foreign institutions; and increase the capability of scientific and technical institutions in developing countries.

Types of projects included in this program are:

(1) **Research/Teaching Grants**—An individual may apply through his institution for support to enable him to conduct research or teach for 9 to 12 months in an academic institution of a developing country. Grants may provide stipend plus air travel allowance for scientists and dependents. Local costs in the foreign country must be met by the host institution.

(2) **International Travel Grants**—An individual may apply for an International Travel Grant to engage in research or teaching in institutions of developing countries for a period not to exceed 9 months. Grants will provide the cost of economy class air travel plus a small amount of incidental expenses. Per diem and local costs must be provided by the host institution.

### Eligibility

Applicants are limited to scientists and engineers from U.S. academic institutions with at least 5 years of postdoctoral or equivalent experience in teaching or research and who will return to their institutions on completion of the project.

Proposals will be considered in the following fields: engineering, physical sciences, earth sciences, biological sciences, social sciences, and science education.

Evidence of the host institution's support for the proposed project must be shown.

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*Additional Information*

Communications may be addressed to: Scientists and Engineers in Economic Development Program, Office of International Programs, National Science Foundation, Washington, D.C. 20550.

# VI. SCIENCE EDUCATION

A major task of the National Science Foundation is to assist in fostering beneficial changes in education in the sciences at all academic levels. Convinced of the importance of science in molding a better future for all people, the Foundation supports projects designed to find ways in which science education can more effectively and more efficiently serve a broad segment of society, make science education relevant to society's needs as well as students' needs and interests, and provide the scientific background necessary to assist people in dealing with problems besetting society.

The Foundation's education program stresses the development of new and more effective ways, in terms of both techniques and costs, of educating people, of developing new approaches to the initial preparation of teachers, technicians and research scientists, and of improving the in-service training of science manpower in such a way as to bring about sound educational reform at all levels of education.

In addition to supporting specific types of activities designed to promote the general objectives mentioned above, the Foundation encourages experimentation with other new and innovative ways of improving education in the sciences. Many of the new directions in educational reform today are the outgrowth of experiments in science education supported by the Foundation as special projects.

Project proposals which may significantly improve science education are encouraged and accepted; awards are made on the basis of merit. Two factors are of primary importance in assessing the merit of a proposed project: (1) does the proposal demonstrate that the activity will be of high scientific and educational quality and give promise of bringing about substantial and lasting improvement in instructional programs in science? (2) does the proposed project merit the respect and confidence of the academic community, and involve the time, effort and leadership of scientists distinguished as investigators and/or teachers in their respective fields?

The majority of proposals for projects to improve education in the sciences are submitted by colleges and universities. Proposals may also be submitted by nonprofit organizations such as professional, scientific, and educational associations or societies, and research institutes and laboratories. Commercial organizations, State and local school systems, and individuals acting independently of institutional sponsorship, while not normally grantees for the support of education in science projects, may under certain circumstances submit proposals and receive support from the Foundation. Such organizations and individuals should consult with the Foundation prior to formal submission of a proposal.

Support of activities relating to education in the sciences is not limited to programs administered by the Office of the Assistant Director for Education toward which this chapter is oriented. In particular, the reader should note those activities supported by the Office of International Programs.

## Graduate Fellowships

The National Science Foundation awards Graduate Fellowships for study or work leading to a master's or doctoral degree in the mathematical, physical, medical, biological, engineering, and social sciences and in the history and philosophy of science. Awards are not made in clinical education, or business fields, or in history or social work, or for work leading to medical, dental, law or joint Ph.D. professional degrees.

Fellowships are awarded for full-time study or research at appropriate nonprofit U.S. or foreign institutions of higher education.

Graduate Fellowships are offered for a period of 3 years, the second and third years to be approved by the Foundation on certification by the fellowship institution of the fellow's satisfactory progress toward an advanced degree in the sciences. The basic stipend is $300 per month of tenure. No dependency allowances will be provided. A fellow may receive concurrently additional educational training remuneration from the Veterans Administration and may receive supplementation of his stipend from institutional funds according to his year of residence at the institution.

### Eligibility

Graduate Fellowships are offered only to individuals who: (1) are citizens or nationals of the United States; (2) have not completed more than 1 year of graduate study by the fall of the first year of fellowship; (3) have demonstrated ability and special aptitude for advanced training in the sciences; and (4) have been or will be admitted to graduate status by the institution selected.

### Deadlines

A brochure on the Graduate Fellowship Program is available each year in October from the Foundation. Applications must be submitted to the Fellowship Office, National Research Council, 2101 Constitution Ave., N.W., Washington, D.C. 20418, by late November. NSF announces the awards in March. Each application must include a complete transcript of college and university records, and a proposed plan for graduate study or research.

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*Additional Information*

Communications should be addressed to: Division of Graduate Education in Science, National Science Foundation, Washington, D.C. 20550.

## Graduate Traineeships

No funds are available for new starts in the fiscal year 1973 Graduate Traineeship Program. The final continuation traineeship awards (approximately 900) will be made in February 1973 for study during 1973-74.

Traineeships are awarded to individuals by the institution, not by the National Science Foundation. Trainees may be appointed at institutional option for part-time or full-time tenure. The basic stipend is $250 per month of tenure. No dependency allowance is provided. An institution may supplement a trainee's stipend from institutional funds according to his year of residence at the traineeship institution.

### Eligibility

To be eligible for tenure under a graduate traineeship, an individual (1) must be a citizen or national of the United States; (2) must be enrolled in a program leading to an advanced degree in science; and (3) must be affiliated with the institution at which he receives his appointment.

### Deadlines

**Institutions.** Eligible institutions will be contacted concerning the procedure for requesting traineeships and the deadline date for submission for traineeship grants.

**Individuals.** A list of institutions in which graduate traineeships are available may be obtained in February 1973 from the Foundation. Individuals wishing to apply for a graduate traineeship should request application forms, brochures, or other information *from the institution* in which he is, or intends to be, enrolled. The deadline for receipt of applications is established by the institution. Traineeship appointments normally must be made before the opening of the fall term.

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*Additional Information*

Communications should be addressed to: Division of Graduate Education in Science, National Science Foundation, Washington, D.C. 20550.

# North Atlantic Treaty Organization (NATO) Postdoctoral Fellowships in Science

In cooperation with the Department of State, the National Science Foundation awards NATO Postdoctoral Fellowships in Science for scientific study of work in mathematics, the sciences (physical, biological, medical, and social), engineering, or interdisciplinary areas. Fellowships are not awarded for support of work toward the M.D., D.V.M., or D.D.S. degrees, nor for support of residency training or similar work leading to qualification in a clinical field.

The NATO fellowship program is designed to assist in obtaining a closer collaboration among the scientists of the NATO nations. Fellowships are awarded for full-time scientific study or work at nonprofit scientific institutions located in foreign countries that are members of or are cooperating with NATO.

Evaluation of applicants will be based on their academic records, letters of recommendation, and ability to carry out the activities program. Consideration is also given to proposed fellowship activities that promote international science cooperation.

The tenure of a NATO Postdoctoral Fellowship in Science is normally 9 or 12 months; in no case may it be less than 6 or more than 12 months. Fellows may begin fellowship activities at any time within 1 year following announcement of the award. The stipend is $7,500 for a full year. A limited travel and dependency allowance may also be provided. During their tenures, NATO fellows may not receive remuneration from another fellowship, scholarship, or similar award, or a Federal grant.

## Eligibility

NATO Postdoctoral Fellowships in Science, awarded by the National Science Foundation, are offered only to individuals who: (1) are citizens or nationals of the United States; (2) have demonstrated ability and special aptitude for advanced training in the sciences; (3) have a doctoral degree in one of the qualifying fields of science; **or** have had scientific training and research experience equivalent to that represented by the science doctorate; **or** have a degree such as M.D., D.D.S., or D.V.M. and desire to obtain further training for a career in research.

This program is designed primarily for applicants who have received their doctorates within the past 5 years. Each applicant must submit an outline of his proposed study under the fellowship and complete transcripts of his college and university records.

## Deadlines

A brochure is available each year in August from the Foundation. Applications must be submitted to the Division of Graduate Education in Science, National Science Foundation, Washington, D.C. 20550, by early October of each year. Awards are announced by the National Science Foundation in February.

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*Additional Information*

Communications should be addressed to: Division of Graduate Education in Science, National Science Foundation, Washington, D.C. 20550.

## North Atlantic Treaty Organization (NATO) Senior Fellowships in Science

In cooperation with the Department of State, the National Science Foundation awards NATO Senior Fellowships in Science for the study of new scientific techniques and developments at nonprofit research and educational institutions in other NATO nations or in countries cooperating with NATO. Awards are made for study or work in mathematics, the sciences (physical, biological, medical, and social), engineering, or interdisciplinary areas. Fellowships are not awarded in clinical, education, or business areas.

Tenure for NATO Senior Fellowships in Science normally ranges from 1 to 3 months; in unusual circumstances a tenure of less than 4 weeks or a maximum of 6 months may be approved. A fellow will receive a subsistence allowance of $16 for each day of tenure and is permitted to receive his regular salary and/or appropriate allowances provided by his nominating institution. A travel allowance is also provided.

### Eligibility

Any U.S. educational institution that offers a postbaccalaureate degree in one of the sciences, or any nonprofit scientific research institution, may nominate for an award a staff member who: (1) is a citizen or national of the United States; (2) has a professional standing in the field with which his fellowship would be concerned; (3) has had at least 5 years' experience in research, teaching, or relevant professional work; and (4) has linguistic abilities necessary for profitable discussion with colleagues in the countries he proposes to visit. The institutional nomination form requires a statement, from the president or other appropriate official of the nominating institution, showing the expected benefits to the institution if the fellowship were awarded.

### Deadlines

Application forms may be obtained from the Division of Graduate Education in Science, National Science Foundation, Washington, D.C. 20550, between August and late January of the following year. The Foundation notifies applicants within 3 to 5 months as to the outcome of their applications.

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*Additional Information*

Communications should be addressed to: Division of Graduate Education in Science, National Science Foundation, Washington, D.C. 20550.

## North Atlantic Treaty Organization (NATO) Advanced Study Institute Participant Grants

The National Science Foundation awards grants to enable U.S. scientists to attend certain NATO Advanced Study Institutes. These meetings, held usually during the summer and varying in length from 1 to 8 weeks, permit exhaustive treatment of a given scientific topic by individuals whose reputations are worldwide.

An international travel grant normally covers the cost of round-trip air fare between the point of origin in the United States and the institute, based on jet-economy, if applicable, or excursion rates. U.S. flag carriers must be used for overseas travel. Per diem is not paid by the Foundation, but in some cases may be available from the NATO institute.

### Eligibility

**Institutes.** Each year the National Science Foundation selects certain institutes to receive support for participant travel and invites the institute director to recommend U.S. participants for such awards. The Foundation then invites the recommended participants to apply for international travel grants.

**Individuals.** To be eligible to receive an NSF international travel grant to attend a NATO Advanced Study Institute, an individual must be: (1) a citizen or national of the United States, and (2) an outstanding young scientist (graduate or recent postdoctoral student).

In addition, individual institutes have specific academic prerequisites for admission. Their announcements should be consulted for details.

### Deadlines

Announcements of NATO Advanced Study Institutes are frequently posted by the departments of colleges and universities and also are printed in professional and academic journals. The Foundation makes available a list of these institutes annually around March. Individuals wishing to attend a NATO Advanced Study Institute should request information from the institute director. The deadline for receipt of applications for admission is established by the institute.

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*Additional Information*

Communications should be addressed to: Division of Graduate Education in Science, National Science Foundation, Washington, D.C. 20550.

## Advanced Science Education Program

The National Science Foundation awards grants to foster the planning and implementation of experimental instructional approaches to graduate science education.

The primary areas of interest are:

(1) The initiation of alternative doctoral-level science degree programs; (2) The development of master's-level science programs that promise to satisfy specific and well-documented needs; (3) The exploration of new techniques and the trial implementation of programs and systems for broadening the opportunities for continuing science education at the graduate level; and (4) Interdisciplinary student-originated research training projects. Proposals are also accepted for the development of individual courses or sequences of courses and the preparation of educational materials and training aids for use at the graduate level.

### Eligibility

Institutions eligible to submit proposals to the Advanced Science Education Program are universities and colleges and other appropriate nonprofit organizations or professional scientific societies. A preliminary proposal should be submitted before preparing a formal proposal. Informal discussion with the NSF project staff is also encouraged. An announcement containing application instructions is available from the Foundation.

### Deadlines

Proposals may be submitted at any time. The period of time required for processing a proposal varies greatly; some proposals require 6 months or more before a decision can be reached.

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*Additional Information*

Communications should be addressed to: Division of Graduate Education in Science, National Science Foundation, Washington, D.C. 20550.

## Summer Institutes for College Teachers

The National Science Foundation awards grants to support summer institutes in advanced-level science, mathematics, and engineering courses for college teachers. Such courses permit exploration in depth of those areas that have become particularly significant for the reorganization and strengthening of the college curriculum by the introduction of new materials and the treatment of older materials in new ways. The duration of the summer institute varies considerably, but recent experience reveals a tendency to favor projects that present materials in concentrated form in periods as short as 5 weeks.

Within the $100-$250 range, each participant may be provided with a weekly stipend equal to 1/40 of the participant's academic year salary for the year preceding the summer the project will be in operation. Travel allowances are also provided.

### Eligibility

**Institutions.** Institutions eligible to apply for grants to support summer institutes are normally colleges and universities with graduate programs where staffing, laboratories, and libraries are adequate for the advanced nature of the work.

**Individuals.** To be eligible to participate in Summer Institutes for College Teachers, an individual must be a U.S. college teacher of one of the sciences (biological, medical, physical, or social), mathematics, or engineering. Teachers at junior or community colleges or technical schools are eligible.

In addition, individual summer institutes have established specific academic prerequisites for admission; their brochures should be consulted for details.

### Deadlines

**Institutions.** An announcement containing guidelines and application materials for the submission of proposals is available from the Foundation. The application deadline is August 1. Grants for Summer Institutes for College Teachers are made in November for the following summer.

**Individuals.** A list of institutions offering Summer Institutes for College Teachers is given in the Directory of College Teacher Programs published annually in late November or early December; the directory is available from the Foundation.

Individuals wishing to apply for admission should request brochures, application forms, and other information from the project director in charge of the institute. The deadline for receipt of applications is established by each local project director.

Participants are selected by the institutions involved, not by the Foundation.

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*Additional Information*

Communications should be addressed to: Division of Undergraduate Education in Science, National Science Foundation, Washington, D.C. 20550.

## Short Courses for College Teachers

The National Science Foundation awards grants for short courses in science, mathematics, and engineering for college teachers. The courses are under the direction of highly competent research scientists who provide specialized short-term instructional programs (less than 4 weeks' duration) covering the most recent advances in selected areas of their scientific fields, which are of particular significance for the strengthening of the college curriculum.

Scheduling of courses is arranged for time periods that are convenient for college teachers, such as early or late summer, or during the academic year.

Within the $100-$250 range, each participant may be provided with a weekly stipend equal to 1/40 of the participant's academic year salary for the year preceding the summer the project will be in operation. Travel allowances are also provided.

### Eligibility

**Institutions.** Institutions eligible to apply for grants to support short courses are normally colleges and universities with graduate programs where staffing, laboratories, and libraries are adequate for the advanced nature of the work.

**Individuals.** To be eligible to participate in Short Courses for College Teachers, an individual must be a U.S. college teacher of one of the sciences (biological, medical, physical, or social), mathematics, or engineering. Teachers at junior or community colleges or technical schools are eligible.

In addition, individual short courses have established specific academic prerequisites for admission; their brochures should be consulted for details.

### Deadlines

**Institutions.** An announcement containing guidelines and application materials for the submission of proposals is available from the Foundation. The deadline for receipt of proposals from institutions is August 1. Grants for Short Courses for College Teachers are made in November for the following summer and academic year.

**Individuals.** A list of institutions offering Short Courses for College Teachers is given in the Directory of College Teacher Programs published annually in late November or early December; the directory is available from the Foundation.

Individuals wishing to apply for admission should request brochures, application forms, and other information from the project director in charge of the project. The deadline for receipt of applications is set by the project director. Participants are selected by the institutions involved, not the Foundation.

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*Additional Information*

Communications should be addressed to: Division of Undergraduate Education in Science, National Science Foundation, Washington, D.C. 20550.

## Student-Originated Studies

The National Science Foundation awards grants in a competitive program for the support of student-originated studies. The program seeks to advance three basic objectives: (1) encourage serious students of science to express in productive ways their concern for the well-being of the nation by making constructive contributions to the understanding of science- or technology-based problems; (2) provide support for groups of college and university students who can demonstrate their readiness to assume increasing responsibility for their own educational development; and (3) provide examples on the basis of which faculty members can assess the desirability of such studies as a mechanism for (a) introducing greater flexibility into the preparation of students for scientific or technical careers, and (b) providing greater motivation toward the study of science as it is related to problems of the real world.

Projects must: (a) meet standards of intellectual rigor, replicability, and—to a reasonable degree—originality; (b) be organized around a single problem or group of logically related societal problems which are science- or technology-based; (c) be interdisciplinary or multidisciplinary in nature; and (d) be student-originated and student-directed.

### Eligibility

**Institutions.** Groups of science students in 4-year colleges and universities are eligible to apply for Student-Originated Studies (SOS) grants. Guidelines are being kept as brief and straightforward as possible to permit maximum diversity and flexibility in the projects proposed. A group of students wishing to ally themselves for a summer's work of 10 to 12 weeks must submit a proposal describing the project they envision.

Each project must name a Student Project Director and a (faculty) Project Advisor. Physical facilities and fiscal services must be provided by a college or university that agrees to accept the grant on behalf of the student group and to serve as its host. Both undergraduate and graduate students may participate in SOS projects. Participants may be drawn exclusively from the student body of the host institution, but inclusion of students from other institutions is strongly encouraged.

A Student-Originated Studies announcement containing guidelines and application materials for submission of proposals is available from the Foundation.

**Individuals.** Students not affiliated with a group applying for SOS support may be accepted for one of the projects supported by the Foundation. A list of the projects that will operate each summer will be mailed to individual inquirers in March. Such individuals must then apply to the Student Project Director of the activity in which they are interested to ascertain what vacancies are available; learn what talents, qualities, or prerequisites are required by the project; and secure application materials, and the like. Individual participants will be selected by local project officials—not by the National Science Foundation.

### Deadlines

The date for receipt of proposals from institutions is in late November; the grant award date is in early March.

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*Additional Information*

Communications should be addressed to: Division of Undergraduate Education in Science, National Science Foundation, Washington, D.C. 20550.

## Undergraduate Research Participation

The National Science Foundation awards grants that provide undergraduate students with research or independent study opportunities under the guidance of competent research directors.

Undergraduate Research Participation grants are awarded for full-time projects of at least 10 weeks' duration. Part-time academic year projects are supported only under unusual circumstances. Short-term projects are also supported according to conditions described in the program's guidelines.

### Eligibility

**Institutions.** Organizations eligible to apply for an Undergraduate Research Participation grant are 4-year colleges, universities, and nonprofit research institutions.

**Individuals.** To be eligible to participate in an Undergraduate Research Participation project an individual must be a full-time undergraduate student and be well-grounded in science. A student may apply for full-time projects at institutions other than the one he attends, and for projects in disciplines other than his major field.

Since each research participation project establishes specific academic prerequisites for student admission, the appropriate project director should be consulted for details.

### Deadlines

**Institutions.** An announcement containing guidelines and application materials for the submission of proposals is available from the Foundation. The date for receipt of proposals is in mid-September; the grant award date is after January 1.

**Individuals.** A list of institutions conducting Undergraduate Research Participation projects is available from the Foundation in February for the following summer.

Individuals wishing to apply for admission should request brochures, application forms, and other information from the project director. Application deadlines are set by the project director. Participants are selected by the institutions involved, not the Foundation.

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*Additional Information*

Communications should be addressed to: Division of Undergraduate Education in Science, National Science Foundation, Washington, D.C. 20550.

## Technician Education Development Program

The National Science Foundation awards grants to assist in the improvement and expansion of post-secondary technician education programs in the United States. Grants are made to support a wide range of activities, though at the present emphasis is placed on efforts falling in either of two broad categories.

(1) **Institutional Technician Program Improvement.** Support to those institutions now ready for and having the capability to carry out improvement in their own technician education programs in an effort to develop a limited number of models which can be exploited in improving or in establishing technician training programs throughout the nation. Institutions selected for model projects are expected to develop an effective plan for transferring their findings and experience to other schools. Under this segment of the program, support is restricted to those programs which provide technical back-up for physical scientists and engineers. Projects may reflect a local need, but priority is given to those which will assist in establishing a broad base of experience needed to ensure that technician education keeps pace with the highly dynamic progress of technology.

(2) **Technician Education Science Course Improvement.** Support to highly qualified individuals or ad hoc groups of scientists, technicians, and educators through technical and professional organizations, colleges, universities, or other institutions for carrying out projects exploring more effective delivery strategies and techniques in science education for technicians, and for developing improved substantive content of courses and curricula. Improvement of course content will be limited to mathematical, biological, physical, and social sciences, engineering, and to appropriate combinations of the foregoing. Projects of this sort must take a national perspective and be designed for wide applicability.

### Eligibility

The Institutional Technician Program Improvement portion of the program is open to all nonprofit 2-year or 4-year institutions offering programs which have as their primary objective that of preparing a person for immediate and productive employment as a technician upon completion of the program.

Support of such programs in proprietary schools or other for-profit institutions will be considered where such organizations have special capabilities.

The Technician Education Science Course Improvement portion is open to colleges, universities, and other nonprofit institutions and organizations.

### Deadlines

Proposals may be submitted at any time; processing requires approximately 6 months. Preliminary proposals are required in all cases. An announcement containing guidelines for the submission of proposals and application materials is available from the Foundation.

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*Additional Information*

Communications should be addressed to: Division of Undergraduate Education in Science, National Science Foundation, Washington, D.C. 20550.

## College Science Improvement Program A: Individual Institutional Projects in 4-Year Colleges

The primary purposes of Program A (CoSIP) are to accelerate development of the science capabilities of predominantly undergraduate institutions and to enhance their capacity for continuing self-renewal. In order to improve the full range of undergraduate education in the sciences and to expand opportunities for undergraduates to become interested in scientific careers as scientists or as science teachers at the elementary, secondary or college level, or to develop the kind of understanding of science and its interactions with society that must be characteristic of educated nonscientists, CoSIP aims to have beneficial effects on professors and students, subject matter and methods of instruction, curricula and individual courses, facilities, equipment, and teaching materials. A proposal will be expected to present a coherent and realistic plan for improving science activities at the undergraduate level.

No specific prescription for an improvement plan will be formulated by the National Science Foundation. The individual means adopted by institutions should vary. Each institution will be expected to develop plans that are built upon its present strengths and oriented toward eliminating its present weaknesses. Creative and original approaches holding greater promise than the following of standard practice will be looked upon with favor. Such creative approaches may certainly include those which promise to effect improvement in the economy of instruction.

The maximum duration of a grant is 3 years; grants will generally not exceed an average of $100,000 per year. Only one proposal from an institution will be considered at any one time.

No grants will be made in this program after June 30, 1973.

### Eligibility

Both new and established institutions are eligible for support.

1. **New institutions.** Eligibility begins one calendar year prior to the institution's formal initiation of classes for its first group of matriculated students.

2. **Established institutions.** Colleges and universities that have strong baccalaureate programs in the sciences, and that did not grant more than 10 Ph.D. degrees in the sciences during the academic years 1961-62 to 1963-64 inclusive, are eligible for grants. Preference is given to institutions awarding 100 or more science baccalaureates in the most recent 3-year period for which data are available.

### Deadlines

Proposals should not be submitted without prior discussion of the project with the program staff. Proposals may be submitted at any time; processing requires approximately 6 to 9 months.

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*Additional Information*

An announcement containing guidelines for the submission of proposals and application materials is available from the Foundation. Communications should be addressed to: Division of Undergraduate Education in Science, National Science Foundation, Washington, D.C. 20550.

Those institutions (or consortia of institutions) which find that their long-range planning logically involves coordinated implementation of improvements in the humanities as well as the sciences should consider the possibility of simultaneous or joint proposals to the Foundation and the National Endowment for the Humanities. For further information on the Endowment's activities in this regard, contact: Division of Education Programs, National Endowment for the Humanities, 806 15th Street, N.W., Washington, D.C. 20506. Institutions contemplating joint or simultaneous proposals to these two agencies should discuss their plans with the appropriate program staffs before developing a proposal.

## College Science Improvement Program B: Interinstitutional Projects in 4-Year Colleges

The primary purposes of Program B, as in Program A, are to accelerate development of the science capabilities of predominantly undergraduate institutions and to enhance their capacity for continuing self-renewal. In order to improve the full range of undergraduate education in the sciences and to expand opportunities for undergraduates to become interested in scientific careers as scientists or as science teachers at the elementary, secondary or college level, or to develop the kind of understanding of science and its interactions with society that must be characteristic of educated nonscientists, this program aims to have beneficial effects on professors and students, subject matter and methods of instruction, curricula and individual courses, facilities, equipment, and teaching materials. A proposal will be expected to present a coherent and realistic plan for improving science activities at the undergraduate level.

This program is intended for projects that are, for academic and/or economic reasons, clearly more appropriately carried out by a group of institutions acting together than by an individual institution acting alone.

No grants will be made in this program after June 30, 1973.

The maximum duration of a grant is 3 years; grants will generally not exceed an average of $100,000 per year.

### Eligibility

Formal and ad hoc associations or consortia of 4-year colleges and universities are eligible to submit proposals for interinstitutional projects.

Institutions eligible to participate as a member of a group are 4-year colleges and universities with baccalaureate programs in the sciences that have not granted more than 10 Ph.D. degrees in the sciences during academic years 1961-62 to 1963-64 inclusive. However, a university that has exceeded that number may serve as advisor to a group of eligible institutions.

### Deadlines

Proposals should not be submitted without prior discussion of the project with program staff. Proposals may be submitted at any time; processing requires approximately 6 to 9 months.

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*Additional Information*

An announcement containing guidelines for the submission of proposals and application materials is available from the Foundation. Communications should be addressed to: Division of Undergraduate Education in Science, National Science Foundation, Washington, D.C. 20550.

Those institutions (or consortia of institutions) which find that their long-range planning logically involves coordinated implementation of improvements in the humanities as well as the sciences should consider the possibility of simultaneous or joint proposals to the Foundation and the National Endowment for the Humanities. For further information on the Endowment's activities in this regard, contact: Division of Education Programs, National Endowment for the Humanities, 806 15th Street, N.W., Washington, D.C. 20506. Institutions contemplating joint or simultaneous proposals to these two agencies should discuss their plans with the appropriate program staffs before developing a proposal.

## College Science Improvement Program D: Projects for Historically Black Colleges

The primary purposes of the program are to accelerate development of the undergraduate science capabilities of historically or traditionally Negro institutions and to enhance their capacity for continuing self-renewal. In order to improve the full range of undergraduate education in the sciences and to expand opportunities for undergraduates to become interested in scientific careers as scientists, or as science teachers at the elementary, secondary or college level, or to develop the kind of understanding of science and its interactions with society that must be characteristic of educated nonscientists, CoSIP aims to have beneficial effects on professors and students, subject matter and methods of instruction, curricula and individual courses, facilities, equipment, and teaching materials. A proposal will be expected to present a coherent and realistic plan for improving science activities at the undergraduate level. Two types of projects, one for individual institutions and one for groups of institutions, are supported.

**Individual Institutional Projects.** No specific prescription for an improvement plan will be formulated by the National Science Foundation. The individual means adopted by institutions should vary. Each institution will be expected to develop plans that are built upon its present strengths and oriented toward eliminating its present weaknesses. Creative and original approaches holding greater promise than the following of standard practice will be looked upon with favor.

The maximum duration of a grant is 3 years; only in exceptional circumstances will requests for over $300,000 be considered. For a project of shorter duration, the limit will be proportionately reduced. Not more than two separate proposals for an individual institutional project will be considered at any one time.

### Eligibility

This program is open to all science baccalaureate-granting historically or traditionally black colleges and universities in the United States.

### Deadlines

Proposals may be submitted at any time; processing requires approximately 6 to 9 months.

**Interinstitutional Projects.** In cases where two or more institutions consider it advantageous to launch a cooperative attack upon common problems, CoSIP will entertain proposals prepared jointly by members of ad hoc or formal consortia of baccalaureate-granting institutions. Support may be requested for a period of up to 3 years. Interinstitutional projects must clearly be more advantageously carried out by a group of institutions than by each institution acting alone.

An **institution** is eligible to participate in an Interinstitutional Project even though it is active in other consortia supported by this program (within the limits given below) and/or has an Individual Institutional Project proposal pending or grant in force. A single department may not, however, participate in more than one interinstitutional project, and a single institution may not participate in more than three such projects.

Proposals may be submitted at any time; processing requires approximately 6 to 9 months.

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*Additional Information*

An announcement containing guidelines for the submission of proposals and application materials is available from the Foundation. Communications should be addressed to: Division of Undergraduate Education in Science, National Science Foundation, Washington, D.C. 20550.

## Undergraduate Science Course Improvement

The central role of this program is to support projects which promise to improve the effectiveness of post-secondary science education in the areas of mathematics; physical, biological, and social sciences; engineering, history, and philosophy of science; and combinations as found in interdisciplinary studies or programs for non-science majors.

To be considered, projects must take a national perspective; those projects whose principal impact is likely to be improvement of instruction locally do not fall within program scope. Among the criteria for selection are originality, validity, leverage, adaptability, and cost-effectiveness.

Support for the development of course materials in significant interdisciplinary fields and emerging, nontraditional scientific fields will be considered. However, generation of course content and supplementary teaching materials in the conventional academic scientific fields for simple incorporation into traditional courses will be subordinate to the development and demonstration of new alternatives. Present intent is to ensure high technical quality and yet stimulate a greater choice of options for a wider range of students. Thus, projects may explore alternative instructional modes, effective applications of technology for the initiation and implementation of these modes, and other improved strategies in science education, and often will involve the utilization of new delivery systems for education and associated specialized materials. The desirability of accommodating to variations in student ability, interest, mobility, and available time will lead to projects designed to match materials, modes of presentation, and sites of learning to diverse needs.

All proposals received by this program for the first time are treated as preliminary proposals and serve as the basis for discussion with the program staff. The purpose of the initial prospectus is to enable the Foundation to determine whether the project described falls within program purview, and to allow program staff to provide the feedback necessary to ensure that formally submitted proposals have the maximum chance for success.

### Eligibility

Institutions eligible to submit proposals for Undergraduate Science Course Improvement are colleges, universities, and other nonprofit institutions and organizations. Under exceptional circumstances, support for others may be considered.

### Deadlines

Proposals may be submitted at any time. Response to preliminary proposals generally takes place within 4 weeks of receipt.

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*Additional Information*

Communications should be addressed to: Division of Undergraduate Education in Science, National Science Foundation, Washington, D.C. 20550.

## Undergraduate Instructional Scientific Equipment

The National Science Foundation awards grants to assist institutions of higher education to significantly improve science curricula at the undergraduate level by providing funds to purchase instructional equipment needed to implement the improvement. Not more than 50 percent of the cost of the equipment will be funded by the Foundation, and the institution's matching funds must be derived from non-Federal sources.

### Eligibility

Institutions eligible to submit proposals for Undergraduate Instructional Scientific Equipment are junior colleges, colleges, and universities.

### Deadlines

An announcement containing guidelines and application materials for the submission of proposals is available from the Foundation. The closing date for receipt of proposals is in late January; the award date is mid-June.

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*Additional Information*

Communications should be addressed to: Division of Undergraduate Education in Science, National Science Foundation, Washington, D.C. 20550.

## Leadership Development Projects for Secondary School Teachers and Supervisors

The National Science Foundation awards grants for Leadership Development Projects (LDP) to provide experienced secondary school teachers and supervisors of science and mathematics with an opportunity to undertake a program of full-time study in science and/or mathematics focusing on curriculum modification, adaptation and implementation, field experience, etc., while on leave from their regular classroom duties.

The primary objective of these projects is to develop the leadership capability of participants for the improvement of science and mathematics instruction in the secondary schools of the nation. An integral part of the instructional program of each project is the development by participants of plans for the betterment of science and/or mathematics education in their home schools. Leadership Development Projects are also intended to encourage the host colleges and universities to utilize the professional capabilities and practical experience of LDP participants in helping to improve programs for pre-service instructional personnel at host institutions, so that they better address the needs of the secondary schools for improved instruction in science and mathematics.

Leadership Development Projects have evolved from the Academic Year Institutes (AYI) Program which has, in recent years, been shifting its primary emphasis from a concern for the subject-matter competence of classroom teachers as an end in itself to a consideration of subject-matter competence as it relates to leadership in science education. To emphasize this transition, which is now essentially complete, the Academic Year Institute Program has been renamed the Leadership Development Projects Program.

For experienced teachers, a stipend of up to $4,000 is paid for the period September 1 to June 30. Dependency and travel allowances are also provided.

### Eligibility

**Institutions.** Institutions eligible to apply for grants to conduct Leadership Development Projects are colleges and universities which offer formal course work, seminars, field experience, etc., appropriate for the development of the leadership competency referred to earlier.

**Individuals.** To be eligible for stipend support in a Leadership Development Project, an individual: (1) must be presently employed as a teacher or supervisor of science or mathematics in grades 7-12 with at least 5 years of teaching experience; (2) must ordinarily have received a bachelor's degree; and (3) must present evidence that the leadership experience gained in the project will be utilized appropriately by his school system. Teachers not meeting all of the above requirements may participate in some of the projects on a tuition-and-fees only basis.

In addition, individual projects establish specific prerequisites for admission; their brochures should be consulted for details.

### Deadlines

**Institutions.** A Leadership Development Project announcement containing grant application materials is available in mid-March from the Foundation. The deadline for receipt of proposals is June 1. Grants are made in mid-September for the following academic year.

**Individuals.** A directory of institutions offering Leadership Development Projects is available in October for the following academic year from the Foundation.

Individuals wishing to apply for admission should request brochures, application forms, and other information from the appropriate project director. Completed application forms must be mailed no later than January 20; successful applicants will be notified of awards by February 15. Participants are selected by the institutions involved, not the Foundation.

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*Additional Information*

Communications should be addressed to: Division of Pre-College Education in Science, National Science Foundation, Washington, D.C. 20550.

## Summer Institutes and Short Courses for Secondary School Teachers

The National Science Foundation awards grants in support of institutes and short courses which during the summer months provide opportunities for the supplementary training of secondary school science and mathematics teachers and supervisors for the purpose of improving the science and mathematics programs in their schools. Some of the projects admit participants from specified regions; others admit participants from throughout the nation. In general, the objectives of a regional institute are determined by identified needs of the region served; the objectives of a nationally oriented institute are determined by recognized needs not feasible to serve on a regional basis.

Toward the purpose of improving science instruction in the schools, a typical summer institute offers one or more of the following: subject-matter study aimed at specific needs of schools, knowledge of new curriculum materials and teaching methods, assistance to teachers in developing materials adapted to their own locales, and development of leadership and supervisory capability.

Short courses are specialized in nature and of short duration, usually 1 to 4 weeks.

Summer institute participants may receive a stipend, ordinarily not exceeding $75 per week, plus dependency and travel allowances. Short-course participants receive an allowance toward the costs of room, board, and travel. Participants in institutes or short courses are exempt from the payment of tuition or academic fees.

### Eligibility

**Institutions.** Institutions eligible to apply for summer institute or short-course grants are colleges and universities which grant at least a baccalaureate-level degree, and appropriate nonprofit organizations.

**Individuals.** To be eligible to attend a Summer Institute or Short Course for Secondary School Teachers, an individual must be currently employed as a teacher or a science or mathematics supervisor at least half time at the secondary school level, grades 7-12. A teacher must teach at least one full course in natural science or mathematics, or must teach substantial amounts of social science in at least one secondary school course.

Priority among applicants to a summer institute—except for qualified returnees in a sequential institute—is given to individuals who have not previously received stipends in summer or academic year institutes and who provide evidence that their participation will assist their schools in improving the schools' science and mathematics programs. Preference is given to individuals who have taught for at least 3 years.

In addition, individual institutes establish specific academic prerequisites for admission; their brochures should be consulted for details.

### Deadlines

**Institutions.** A summer institute announcement containing grant application materials is available in mid-March from the Foundation.

The deadline for receipt of proposals is July 1. Grants for summer institutes are awarded in November for the following summer. Proposals for short courses should be submitted by October 1.

**Individuals.** A directory of institutions offering summer institutes and short courses for the following summer is available in January from the Foundation. Individuals wishing to apply for admission should request brochures, application forms, and other information from the appropriate director. Completed application forms must be mailed no later than March 1. Participants are selected by the institutions involved, not the Foundation.

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*Additional Information*

Communications should be addressed to: Division of Pre-College Education in Science, National Science Foundation, Washington, D.C. 20550.

## In-Service Institutes for Secondary School Teachers

In-Service Institutes aim to:

(1) implement instructional improvement in science on the secondary level through the education of secondary school instructional, supervisory, and resource personnel; and

(2) assist colleges and universities in the development, as part of their regular activities, of more effective programs for the education of both pre-service and in-service secondary school science and mathematics teachers.

An individual project centers around a program of study for teachers, supervisors, or resource personnel offered at times so chosen that participants can attend on a part-time basis while engaged in their regular duties.

Grants provide funds to defray all or part of the costs for operation of the project so that participants can attend without being charged tuition or fees. In addition, funds may be requested for a book purchase allowance and a travel allowance for commuting expenses.

### Eligibility

**Institutions.** Organizations eligible to apply for grants to support In-Service Institutes for Secondary School Teachers are universities and colleges that grant at least a baccalaureate-level degree and other appropriate nonprofit organizations.

**Individuals.** To be eligible to attend an In-Service Institute for Secondary School Teachers, an individual must be a supervisor or teacher of science or mathematics in grades 7-12. In addition, individual institutes establish specific academic prerequisites for admission; their brochures should be consulted for details.

### Deadlines

**Institutions.** An in-service institute announcement containing grant application materials is available in early September from the Foundation. The deadline for receipt of proposals is in October; grants are awarded in March for the following academic year.

**Individuals.** A directory of institutions offering in-service institutes is available in April for the following academic year from the Foundation. Individuals wishing to apply for admission should request brochures, application forms, and other information from the appropriate institute director. The deadline for receipt of applications is established by each institute director and is given in the specific institute brochure. Participants are selected by the institutions involved, not the Foundation.

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*Additional Information*

Communications should be addressed to: Division of Pre-College Education in Science, National Science Foundation, Washington, D.C. 20550.

## Cooperative College-Science Program

The National Science Foundation awards grants that enable school systems and nearby colleges or universities to work cooperatively to bring about significant improvements in science (includes social science) or mathematics programs of school systems. Projects may focus on elementary or secondary school programs.

The program is an *implementation* program; that is, it seeks to bring about a specified change in designated classrooms. Projects are expected to reflect the needs and plans of the cooperating school systems. They may be designed to strengthen current courses of study, to adapt new materials to local use, to prepare teachers in subject matter and methodology relevant to the school system's instructional needs, or to accomplish a combination of activities.

Projects may provide for the training of key staff members of the school systems in the summer and follow-up activities during the school year when the strengthened or new programs are implemented. Orientation activities may take place in the spring preceding the summer phase.

### Eligibility

**Institutions.** Institutions eligible to submit proposals to the Cooperative College-School Science Program are universities, colleges, and other appropriate nonprofit organizations. Grants are not made directly to elementary or secondary school systems, but close collaboration between school systems and the grantee institution in designing the proposal and carrying out the project is essential.

**Individuals.** To be eligible for participation in a project, a teacher must be employed by the collaborating school system. Selection of participants is made jointly by the cooperating institution and the local school system.

### Deadlines

**Institutions.** An announcement containing grant application materials is available in April from the Foundation. The deadline for receipt of proposals is in mid-August; grants are awarded in December for the following spring, summer, or academic year.

**Individuals.** Announcements of grants and qualifications for participants are made locally and disseminated to eligible teachers.

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*Additional Information*

Communications should be addressed to: Division of Pre-College Education in Science, National Science Foundation, Washington, D.C. 20550.

## Pre-College Curriculum and Instruction Development Program

The National Science Foundation awards grants that assist scientists and engineers working with educators to carry out projects for the improvement of education in the sciences (including social science), mathematics, and engineering for the educational levels from kindergarten through the twelfth grade. High priority will be given to projects designed for a broad-ability range of students in the elementary and secondary schools, and to the development of interdisciplinary courses and units which relate science and technology to environmental and societal problems. Examples of projects that have received support are: (1) committee and conference studies designed to identify problems in a given field and to formulate guidelines for the evolution of modern instructional programs; (2) planning and coordination projects designed to develop basic guidelines for course improvement, to stimulate the initiation of appropriate projects, to correlate independent developmental projects, and to facilitate wide dissemination of the results of such efforts; (3) projects whose studies of the learning process can be expected to be useful to other study groups in developing improved curriculum materials; (4) projects for the development of course segments dealing with new approaches to subject-matter presentations through written materials, film, television, laboratory experiments and equipment, computer applications or programmed media; (5) projects to develop models of outside-the-classroom instruction; (6) projects to develop modes of instruction which approach in a realistic way the needs of non-academically oriented students; (7) projects to develop complete model courses or course sequences, using many types of learning and teaching aids; (8) projects designed to study the educational system with particular reference to the application of scientific principles to educational processes; (9) evaluation projects designed to provide a record of the diffusion and implementation process for new course materials and to indicate more effective means for diffusion and implementation of the new course materials; and (10) projects to strengthen the knowledge base and leadership abilities of those involved in the selection, adaptation, and adoption of new curricula in the schools (these projects include Resource Personnel Workshops and Administrators' Conferences).

### Eligibility

Institutions eligible to submit proposals for Pre-College Course Content Improvement projects are colleges and universities and other appropriate nonprofit organizations. Elementary and secondary schools, school systems, and State departments of education are normally excluded as grantees, although the involvement of schools and teachers in all phases of the development of materials is essential.

### Deadlines

Proposals for projects falling under category (10) have an October 1 deadline. Proposals for projects under other categories may be submitted at any time. Prospective proposers are encouraged to describe their projects in a preliminary document so that the Foundation can determine whether a formal proposal can be considered.

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*Additional Information*

Communications may be addressed to: Division of Pre-College Education in Science, National Science Foundation, Washington, D.C. 20550.

## Student Science Training Program (Pre-College)

The National Science Foundation awards grants that provide advanced educational opportunities for superior secondary school students. These activities, usually conducted at the grantee institution, encourage student participation in either scientific research or special course work.

The program is designed to help identify and accelerate the scholarly development of high-ability students who have excellent potential for becoming creative scientists. It also seeks to provide examples of educational programs in the sciences for secondary school students as a mechanism for encouraging secondary schools to improve their own programs.

Training is usually offered during the summer in sessions of at least 5 weeks' duration, although academic year projects may also be supported. Research participation projects afford the student the opportunity to work with experienced scientific investigators and to obtain firsthand knowledge of research methods and techniques. Course-oriented projects present subject matter at a level more advanced than can be expected in high school.

Costs of instruction are paid by the Foundation; the student is expected to pay his own expenses for room, board, and travel. Financial assistance is available for students who otherwise would be unable to attend.

### Eligibility

**Institutions.** Institutions eligible to apply for grants under the Student Science Training Program (Pre-College) are universities and colleges which grant at least a baccalaureate-level degree, and other appropriate nonprofit organizations.

**Individuals.** To be eligible to participate in a student science training project, an individual must be a high-ability secondary school student, as evidenced by school records. Summer projects are open primarily to students who will be completing their junior year (11th grade) at the time of application. Academic year projects are open to students from the 10th, 11th, and 12th grades.

In addition, individual projects establish specific academic and other prerequisites for admission; their brochures should be consulted for details.

### Deadlines

**Institutions.** An announcement containing grant application materials is available in April from the Foundation. The deadline for receipt of proposals is late August. Grants are awarded in December for the following summer and academic year.

**Individuals.** A directory of institutions offering science training programs for high-ability secondary school students is available in January for the following summer from the Foundation.

Individuals wishing to apply for admission should request brochures, application forms, and other information from the appropriate project director. The deadline for receipt of application forms is established by the project director and usually falls between March 1 and April 1 for summer projects. Participants are selected by the institutions involved, not the Foundation.

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*Additional Information*

Communications may be addressed to: Division of Pre-College Education in Science, National Science Foundation, Washington, D.C. 20550.

## Pre-Service Teacher Education Program

The National Science Foundation awards grants to improve programs for the preparation of prospective teachers of science at pre-college levels. The objectives of the program are to foster the types of curricular change at colleges which will increase the scientific and pedagogical competence of graduates during their teaching careers.

Projects under the Pre-Service Teacher Education Program (UPSTEP) may include any activity or combination of activities that can be shown to improve the preparation of undergraduate students for careers as elementary or secondary school science teachers, or that can be designed and tested for such improvement. It is during the undergraduate years that the student has maximum access to formal knowledge of subject matter, of teaching methodology, and of learning theory. Proposals should therefore show that both education and science departments will be jointly involved in producing graduates who are thoroughly prepared, both substantively and pedagogically, to become science teachers.

The many problems of science teacher education are more likely to be mitigated if the design and execution of improvement projects include representatives of all of the groups involved, including students and supervising teachers.

Projects already under way include many of the following activities: recruitment into science teaching careers by informing students and strengthening communication with their teachers; teaching science and education courses through the use of instructional methods specifically designed to convey process skills in the subject being taught; providing students with diverse teaching and other classroom responsibilities prior to the required student teaching; developing close collaboration of college science faculty and school supervising teachers; including in the undergraduate preparation a thorough grounding in the more modern elementary and secondary courses and curricula; maintaining close liaison with new graduates and their administrative superiors; and supporting student and supervising teachers by assembling materials and advisory staffs for continuing self-renewal and professional growth.

### Eligibility

Institutions eligible to submit proposals under UPSTEP are 4-year colleges and universities that have elementary or secondary school teacher education programs in the sciences. Proposals may also be submitted by existing or ad hoc consortia of institutions. A brochure containing suggestions for submission of proposals is available from the Foundation. It is required that the proposed project first be described in a preliminary proposal with sufficient detail to permit the Foundation to determine whether a formal proposal should be submitted.

### Deadlines

Proposals may be submitted at any time; processing requires 6 to 9 months. For projects with a June or September starting date, three copies of the preliminary proposal should be received in the Foundation the preceding November.

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*Additional Information*

Communications should be addressed to: Division of Undergraduate Education in Science, National Science Foundation, Washington, D.C. 20550.

## Technological Innovation in Education Programs

The National Science Foundation awards grants to support the exploration and development of innovative uses of the computer and related communication technologies in education. The objectives of support through these programs include (1) the exploration and development of innovative communication technologies and techniques of potential application to education; (2) the exploration, development, and evaluation of computer-oriented and related technologically oriented instructional concepts and curricular materials; and (3) the exploration and evaluation of various computer-based and related technologically oriented systems for effective and cost-efficient instruction.

**Computer Technology and Systems Program**—Awards in this program support research in computer technology and techniques applicable to education, and projects focused on the testing and evaluation of special systems.

**Computer-Oriented Curricular Activities Program**—This program supports projects aimed at (1) the development, test, and evaluation of curricular materials in selected disciplines to support new, innovative uses of computing in instruction; (2) the development, test, and evaluation of new instructional concepts related to computer-based education; and (3) the development of mechanisms to disseminate and facilitate the widespread use of such materials and concepts.

**Special Projects Program**—This program supports projects to explore and develop the use of modern communication technologies, including computer-based and related systems which may increase the effectiveness of the instructional process and decrease the costliness of instruction.

### Eligibility

Guidelines on eligibility and proposal preparation and other helpful suggestions are contained in the NSF brochures **Grants for Computing Activities, Grants for Scientific Research,** and **Grants for Education in Science** which may be obtained from the Foundation.

### Deadlines

Proposals may be submitted at any time.

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*Additional Information*

Communications may be addressed to: Technological Innovation in Education, Office of the Assistant Director for Education, National Science Foundation, Washington, D.C. 20550.

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This program is administered by the office of the Assistant Director for Education.

# VII. COMPUTING ACTIVITIES

The Office of Computing Activities (OCA) was established in the Foundation in July 1967, to provide Federal leadership in exploring and developing computer technology and the uses of the computer. OCA administers programs directed at supporting basic research in computer science and engineering; research leading to advanced computer-based research techniques, systems, software and network activities; and the investigation of the impact of the computer on organizations and on the individual.

OCA is a component of the Directorate of National and International Programs.

## Computer Science and Engineering Programs

The National Science Foundation awards grants to support research in the computer science and engineering areas. The primary objective is to stimulate the creation of the scientific base of computer development.

The areas of research supported through the three programs within Computer Science and Engineering are indicated below. Projects may contain elements considered within several programs or deal with topics not explicitly mentioned here. The primary focus of the research will determine which program will consider the proposal.

**Theoretical Computer Science Program**—This program supports basic research in the theory of computation, numerical analysis and computational mathematics, theory of formal languages, intelligent systems, and other topics concerned with the theoretical foundations of computer science.

**Software and Programming Systems Program**—Awards in this program support basic and applied research on software and systems of programs including operating systems, computer languages and their processors, information structures and file management, man-machine interaction, graphics, and the study of algorithms.

**Computer Systems Design Program**—Grants for basic and applied research focusing on the development of principles of computer systems design include computer system architecture, computer system performance, major subsystems, and logic design.

### Eligibility

Guidelines on eligibility and proposal preparation and other helpful suggestions are contained in the NSF brochures **Grants for Computing Activities** and **Grants for Scientific Research** which may be obtained from the Foundation.

### Deadlines

Proposals may be submitted at any time.

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*Additional Information*

Communications may be addressed to: Office of Computing Activities, National Science Foundation, Washington, D.C. 20550.

## Computer Applications in Research Programs

The National Science Foundation awards grants to support research applications of computers and computer-based systems in science research. The potential usefulness of computers in research has increased markedly with advances in technology which, for example, make possible a high degree of interaction between the researcher and the computer via remotely located terminals, enable computers to be used on-line in complex experimental research activities, and permit the establishment of sophisticated computer communication networks for resource sharing. Projects in Computer Applications in Research focus on the exploitation of these and other advances in computer technology in achieving a closer coupling of computers and research.

**National Network Program**—NSF awards in this program include research, exploratory activities, and special studies to develop the resource-sharing potential of a national network of computer-based resources in the support of research and education. This program is coordinated with related activities of the Office of Science Information Service. Special attention will be given to collaborative efforts, independent of institutional affiliation, for development of innovative and effective approaches to resource sharing. Issues and considerations include specialized resources, user functions, organization aspects, economic implications, network technology and evaluative activities. A more complete description and guidelines for proposal preparation are contained in the NSF brochure **Expanded Research Program Relative to a National Science Computer Network.**

**Techniques and Systems Program**—Awards are made in this program for projects to transfer advances in computer science into new computer-based methodology for research. Projects include advances in interactive techniques, on-line and real-time systems, hierarchical computing, and other applications of recent developments in computer and communication technology. Proposals are examined critically in this program to assess the potential contribution of the proposed work to research in the intended area of application.

**Software Quality Research Program**—Research and developmental activities are supported which are directed at providing researchers with accurate, consistent, well-documented, and extensively tested software. Strong emphasis is placed on considerations of software analysis, robustness, performance, validation, and related topics. Projects range, for example, from research in numerical analysis techniques used in programs to program testing methodology. In addition, special encouragement is given to projects to develop improved approaches to portability, availability, and distribution of computer software applicable to research.

### Eligibility

Guidelines on eligibility and proposal preparation and other helpful suggestions are contained in the NSF brochures **Grants for Computing Activities, Grants for Scientific Research,** and **Expanded Research Program Relative to a National Science Computer Network,** which may be obtained from the Foundation.

### Deadlines

There are no deadlines for proposals submitted to these programs.

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*Additional Information*

Communications may be addressed to: Office of Computing Activities, National Science Foundation, Washington, D.C. 20550.

## Computer Impact on Society

The National Science Foundation awards grants for studies, research, and demonstrations which lead to a greater understanding of how computers and associated information technology are affecting our social organizations and way of life. Initially, the programs will be concerned with the following two thrusts:

**Computer Impact on Organizations Program**—This program supports projects in the areas of scientific activities concerned with creative use of computer and information technology supportive to management and decision-making at all levels; computer impact problems in such areas as law and economics; and real-time computer use in process automation, robotics, traffic flow, and other new fields.

**Computer Impact on the Individual Program**—This program is concerned with scientific activities regarding use by citizens of machine-based information resources with emphasis on ease of access, accuracy, intelligibility, confidentiality, and related problems; human and technical approaches to improving communication through the human/machine interface especially for non-technical users; and the development of computer and information technology which will service individual human needs.

### Eligibility

Guidelines on eligibility and proposal preparation and other helpful suggestions are contained in the NSF brochures **Grants for Computing Activities** and **Grants for Scientific Research,** which may be obtained from the Foundation.

### Deadlines

Proposals may be submitted at any time.

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*Additional Information*

Communications may be addressed to: Office of Computing Activities, National Science Foundation, Washington, D.C. 20550.

# VIII. SPECIAL PROGRAMS

## Experimental Research and Development Incentives

The National Science Foundation supports a program designed to provide experimental evidence concerning various incentives which the Federal Government might use to increase the application and use of science and technology in the civil sector.

The objectives of this program are:

- To identify institutional barriers to innovation; and
- To test appropriate Federal action which might reduce such barriers.

The program will provide a focus in the Federal structure for testing various means of accelerating the rate of technological innovation in the private and public sectors of the economy. The program will support (1) background studies to identify and understand barriers and blockages to the technical innovation process in selected areas of application; and (2) experiments designed to investigate incentives intended to overcome these blockages. Each experiment will support tests of the effect of a specific incentive mechanism on a barrier or set of barriers which inhibit the innovative process.

Those proposing to participate in this program will be expected to demonstrate their commitment by agreement to cost share on a basis commensurate with the potential financial benefit to themselves.

Before submitting a proposal for support, descriptive brochures on the program should be consulted.

### Eligibility

Proposals may be submitted by colleges and universities; industrial or trade associations; industrial organizations; and public service institutions, research institutions, and nonprofit organizations, including State and local governments. These proposals may provide for collaborative arrangements with other universities, nonprofit, and/or profit-making organizations. Cooperative projects between two or more institutions of differing types are encouraged.

### Deadlines

Proposals may be submitted at any time. Approximately 3 to 6 months are required for consideration of proposals.

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*Additional Information*

The publication **Announcement for Experimental R&D Incentives Program** gives a more detailed explanation of the program requirements. Communications may be addressed to: Office of Experimental R&D Incentives, National Science Foundation, Washington, D.C. 20550.

## National R&D Assessment Program

The primary purpose of this program is to provide an analytical capability, consonant with the expressed needs of Congress and the Executive Office of the President, for objective study and assessment of how science and technology contribute to the achievement of national goals and objectives. Through this program, the National Science Foundation analyzes patterns of R&D/technological innovation; the incentives and decisions that underlie the existing patterns; and the implications that our choice of options has in shaping future patterns of R&D/technological innovation.

The program is designed to achieve a fuller understanding of:

- Relationships between Government policy options and R&D/technological innovation;
- Socioeconomic effects of R&D/technological innovation (e.g., productivity, employment, income, foreign trade, and individual well-being);
- Processes of technological innovation;
- Data and information relating to R&D/technological innovation, and gaps in the data and information.

The program will utilize existing data and research sponsored by other agencies and other NSF programs to the maximum extent feasible. New research will be conducted and supported, however, to meet the objectives of the program.

### Eligibility

The work of this new program will be performed by a group of analysts, responsible to the Office of the Director and reporting to the Deputy Director, and through grants and contracts with universities and other appropriate organizations.

Study proposals which are supportive of the program plans will be considered for awards. The program of studies will be a cooperative effort involving the analytical staff at the Foundation and a limited number of extramural grants and contracts (about 20 per year).

### Deadlines

Proposals may be submitted at any time during the year. Approximately 3 to 6 months should be allowed for review and decision.

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*Additional Information*

Detailed program plans and more detailed criteria for proposal preparation and submission are available from the Office of National R&D Assessment, National Science Foundation, Washington, D.C. 20550.

## Institutional Grants for Research Management Improvement

The National Science Foundation awards grants designed to support research management improvement activities in universities, colleges, and other nonprofit research institutions.

Problems related to future academic research—its growth, the establishment of new research institutes, the interface with industry, the need to relate to education, the growing emphasis on interdisciplinary approaches, and the dichotomy between little and big science—compel the universities to consider the impact of the growing research activities on their research environment.

The objective of the program is to enable institutions with substantial Federal research support to manage their research programs better. Strict criteria as to the kinds of proposals that will be accepted have not been established, as it is expected that institutions will propose a variety of innovative measures to improve the management of their research activities.

### Eligibility

The program is directed primarily to research-oriented universities and institutions, and the support will be given directly to the administrative element of a university or institution. Groups of universities and colleges are also eligible to apply under joint or parallel proposals.

### Deadlines

The deadline for submitting proposals in fiscal year 1973 was November 15, 1972. There are no established deadlines for fiscal year 1974.

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*Additional Information*

NSF Important Notice No. 44, "Institutional Grants for Research Management Improvement," is available from the Foundation. Inquiries and preliminary proposals should be directed to: Research Management Improvement Program, Office of the Deputy Assistant Director for National and International Programs, National Science Foundation, Washington, D.C. 20550.

Formal proposals should be addressed to: Research Management Improvement Program, c/o Central Processing Section, National Science Foundation, Washington, D.C. 20550.

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This program is administered by the office of the Assistant Director for National and International Programs.

## Institutional Grants for Science Program

The National Science Foundation awards grants for broad institutional use to colleges and universities, based on Federal research awards from any one of the Federal departments or agencies reporting obligations to the Committee on Academic Science and Engineering. These are flexible funds for use at the discretion of the institution to strengthen and balance science programs of research and education. The funds may not be used for indirect costs.

The grants are computed by a graduated formula based on Federal research awards received by the institution during the previous fiscal year.

### Eligibility

Institutions eligible to apply for grants under the Institutional Grants for Science Program are colleges and universities receiving Federal research awards, excluding those of the Public Health Service, during the previous fiscal year (July 1—June 30). Grants made by the Foundation through its programs of Undergraduate Research Participation, and Student-Originated Studies also establish eligibility for Institutional Grants and are included in the base for their computation.

### Deadlines

Announcements are available in May of each year from the address listed below. The application deadline is July 31. Grants are announced in December.

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*Additional Information*

Communications should be addressed to: Institutional Grants for Science Program, National Science Foundation, Washington, D.C. 20550.

## International Travel Grants

The National Science Foundation awards international travel grants to assist scientists to go abroad for one of the following purposes:

(1) Attending international scientific congresses and meetings;

(2) Obtaining or exchanging information in the areas of basic research, science education, science information or information relating to international scientific programs and associated activities;

(3) Cooperating in international scientific activities.

International travel is defined as all travel outside the United States and its possessions Canada, and Puerto Rico.

NSF each year selects certain meetings, in areas of particular interest to the Foundation, for which participant support may be granted.

International travel grants made to individuals are based on, and normally limited to, the equivalent cost of jet-economy air transportation from the city where the traveler resides, or is employed, to his destination abroad and return. A per diem may be paid when an individual is traveling as a representative of the U.S. Government. Travel must be by U.S. flag carriers, except in special circumstances.

### Eligibility

Requests for international travel grants may be submitted by individual U.S. scientists or by nonprofit organizations (usually professional societies). When a request is submitted by an individual U.S. scientist, NSF form 192, Application for International Travel Grant, available from the Foundation, should be used.

### Deadlines

Approximately a month is required to process requests, but those for travel to meetings should be submitted well in advance because evaluation of requests normally occurs several months before the meeting date.

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*Additional Information*

Communications may be addressed to the appropriate office: Division of Biological and Medical Sciences; Division of Engineering; Division of Environmental Sciences; Division of Mathematical and Physical Sciences; Division of Social Sciences; Division of Materials Research; Office of Science Information Service; Office of International Programs; Office of Computing Activities; Office for the International Decade of Ocean Exploration; Office of Polar Programs; Advanced Science Education Program, Division of Graduate Education in Science; or Research Applications Directorate; National Science Foundation, Washington, D.C. 20550.

## Scientific Conference Grants

The National Science Foundation awards grants to support conferences and symposia that bring together leading scientists who are pioneering in new or incompletely explored fields of science.

The Foundation does not provide support for regular meetings of scientific societies. Support for special conferences should be requested only if regular meetings of professional societies do not provide the necessary forum.

### Eligibility

Proposals for support for scientific conferences may be submitted by colleges and universities, nonprofit research institutions, or scientific or professional societies. Concomitant support by several Federal agencies or private organizations is permissible.

### Deadlines

Proposals for Scientific Conference Grants may be submitted at any time.

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*Additional Information*

Communications may be addressed to the following divisions or offices as appropriate: Division of Biological and Medical Sciences; Division of Engineering; Division of Environmental Sciences; Division of Mathematical and Physical Sciences; Division of Social Sciences; Division of Materials Research; Office of Computing Activities; Office of Science Information Service; Office for the International Decade of Ocean Exploration; Office of Polar Programs; Office of International Programs; or Research Applications Directorate; National Science Foundation, Washington, D.C. 20550.

## Science Information Service

The National Science Foundation awards grants and contracts to improve the dissemination of scientific information. Foundation support may be provided for the following activities:

(1) Development and improvement of information systems (for bibliographic materials) and data systems (for quantitative data).

(2) Development of new and improved methods of publication, and the publication of essential scientific materials.

(3) Research in science information, including both theoretical and applied aspects.

The Foundation's brochures **Improving the Dissemination of Scientific Information** and **Grants for Scientific Research** should be consulted for additional information on scientific information programs and instructions for submission of proposals.

### Eligibility

Institutions eligible to submit proposals are professional scientific and technical societies, universities and colleges, and organizations both for-profit and not-for-profit. Organizations that plan to submit proposals are encouraged to discuss their ideas informally with the appropriate staff members before preparing formal proposals.

### Deadlines

Proposals may be submitted at any time; approximately 3 months are required to consider a proposal.

PLEASE NOTE *The Office of Science Information Service is not organized for the following services:*

*(1) Provide bibliographic or reference services or perform literature searches.*

*(2) Furnish copies of publications resulting from research sponsored by NSF or other organizations.*

*(3) Hire translators or perform translations of any foreign publications.*

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*Additional Information*

Communications may be addressed to: Office of Science Information Service, National Science Foundation, Washington, D.C. 20550.

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This program is administered by the office of the Assistant Director for National and International Programs.

## Special Foreign Currency Programs

The National Science Foundation makes awards to support scientific activities overseas which will incur costs payable in the currencies of Burma, Egypt, Guinea, India, Pakistan, Poland, and Tunisia. These awards are in two categories: grants for research, science education, and related activities; and contracts for procurement of scientific and technological information. They utilize foreign currencies which the Treasury Department has determined to be in excess of the established requirements of the United States.

**Research, Science Education, and Related Activities**—Three main classes of activity are included in this program: cooperative research and science education projects, international travel, and visiting scientist activities. A principal purpose of the program is to promote the establishment of enduring collaborative relationships between scientists and institutions of the United States and participating countries.

The Foundation brochure **NSF Special Foreign Currency Program, Support for Research, Science Education, and Related Activities, Information for U.S. Scientists** describes the classes of activity supported and provides other information. A companion publication, subtitled **Information for Scientists in Participating Countries,** is also available. The program offers no dollar support; requests for necessary dollar support by U.S. institutions may be included in proposals for consideration by other program offices of NSF.

**Foreign Science Information Program**—In fulfilling its responsibility for coordinating the needs of U.S. Government agencies, the Foundation contracts with organizations in participating countries (including Israel) for delivery of scientific and technological information to the United States. Contracts cover translation, abstracting, indexing, reviewing, and publication in English of significant foreign scientific literature. The preparation and publication of surveys, directories, guides, and other reference aids on foreign scientific and technical information resources—literature, institutions, scientists—is also undertaken under contract.

The following sections on eligibility and deadlines refer only to **Research, Science Education, and Related Activities.**

### Eligibility

Organizations eligible to submit project proposals are nonprofit higher educational institutions, scientific institutes, scientific and technical societies, and similar organizations, chartered to conduct business in the United States or the participating country. Scientists affiliated with such organizations may apply for support for international travel or visiting scientist activities.

Agreement on the objectives, content, and scope of a cooperative project should be reached by U.S. and foreign scientists before they submit proposals. Consultation or correspondence with the Office of International Programs by prospective U.S. or foreign proposers prior to submission of a formal proposal is recommended. Formal proposals should be prepared in accordance with the requirements outlined in the relevant NSF brochures. Project proposals to be funded in foreign currency must be approved by the government of the participating country; the scientific institution in that country which is co-sponsor of the project initiates the request for approval.

### Deadlines

Proposals for activities to be funded by foreign currency may be submitted at any time. Approximately 6 months are required to

consider a project or visiting scientists proposal; 3 months are required to consider a proposal for an international travel grant.

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*Additional Information*

Communications may be addressed to: Special Foreign Currency Program, Office of International Programs, National Science Foundation, Washington, D.C. 20550.

Requests for information about the availability of materials produced under the Foreign Science Information Program should be addressed to National Technical Information Service, U.S. Department of Commerce, Springfield, Va. 22151.

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This program is administered by the office of the Assistant Director for National and International Programs.

## Public Understanding of Science

The National Science Foundation considers one of its important responsibilities to be the development of a greater public understanding of science. In addition to fostering public understanding of science as part of many grant programs, the Foundation has a special program of Public Understanding of Science seeking to bring direct focus and support to this area. Central to the purpose of this program is the enhancement of citizen knowledge and understanding of both the potentials and limitations in the use of science and technology in meeting current and emerging societal problems.

Proposals are encouraged which relate to one of the following programs, within terms of a single or combined focus.

**Information Projects on Science**—Proposals to be considered under this general support area should facilitate the dissemination of information on science for the general public. Examples of the types of projects which may be eligible for support are: special purpose films and television programs, science exhibits, science forums for laymen, and comparable activities.

A limited number of projects are funded which focus on either increasing the scientific knowledge of new media personnel or promoting the exchange of ideas through seminars and conferences between scientists and laymen on science policy issues of national and regional import.

**National, Regional, and Community Programs**—Proposals may be submitted for pilot programs in public understanding of science designed to serve either broad or specific audiences of a national, regional, community, or other discrete geographical area. Such programs will normally be multipurpose in nature and encompass diverse means of communication. Interinstitutional arrangements are particularly encouraged on a matching funds basis.

**Research and Methodological Studies**—Proposals may be submitted for research or analytical studies of the communications process as it relates to public understanding of science. This category may also include the testing and evaluation of new approaches in communicating scientific information to nonscientists.

### Eligibility

Institutions eligible to submit proposals are colleges, universities, and independent, nonprofit organizations.

### Deadlines

Proposals may be submitted at any time. Project proposals should initially be submitted informally for preliminary review. Processing of formal proposals normally requires at least 3 months.

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*Additional Information*

The **Public Understanding Science** brochure describes the process of submitting proposals in more detail. Communications may be addressed to: Office of Public Understanding of Science, National Science Foundation, Washington, D.C. 20550.

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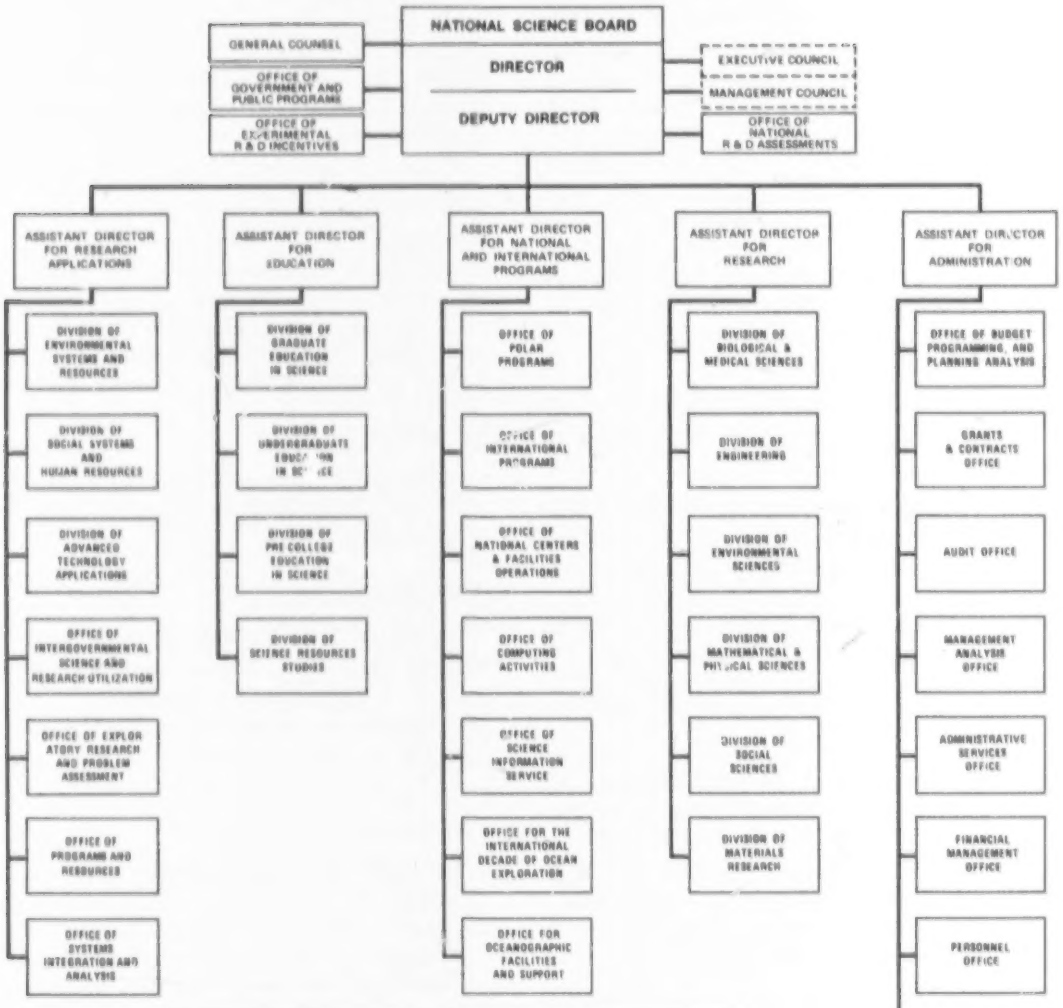
This program is administered by the Office of Government and Public Programs.

# ORGANIZATION
## NATIONAL SCIENCE FOUNDATION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PERSONNEL OFFICE
MANAGEMENT INFORMATION OFFICE
PROGRAM REVIEW OFFICE
HEALTH SERVICE

## NSF ABBREVIATIONS

| | |
|---|---|
| Administrative Services Office | ASO |
| Advanced Technology Applications, Division of | ATA |
| Assistant Director for Administration | AD/A |
| Assistant Director for Education | AD/E |
| Assistant Director for National & International Programs | AD/NI |
| Assistant Director for Research | AD/R |
| Assistant Director for Research Applications | AD/RA |
| Audit Office | AUT |
| Biological & Medical Sciences, Division of | BMS |
| Budget, Programming, and Analysis, Office of | BPA |
| Computing Activities, Office of | OCA |
| Director, Office of | O/D |
| Engineering, Division of | ENG |
| Environmental Biology, Division of | EBI |
| Environmental Systems and Resources, Division of | ESR |
| Experimental R&D Incentives, Office of | REI |
| Exploratory Research and Problem Assessment, Office of | ERPA |
| Financial Management Office | FMO |
| General Counsel, Office of | OGC |
| Government and Public Programs, Office of | GPP |
| Graduate Education in Science, Division of | GES |
| Grants & Contracts Office | GCO |
| Intergovernmental Science and Research Utilization, Office of | IGRU |
| International Decade of Ocean Exploration, Office for | IDOE |
| International Programs, Office of | OIP |
| Management Analysis Office | MAO |
| Management Information Office | MIO |
| Materials Research, Division of | DMR |
| Mathematical & Physical Sciences, Division of | MPS |
| National Centers & Facilities Operation, Office of | NCF |
| National R&D Assessment, Office of | RDA |
| Oceanographic Facilities and Support, Office of | OFS |
| Personnel Office | PER |
| Polar Programs, Office of | OPP |
| Pre College Education in Science, Division of | PES |
| Program Review Office | PRO |
| Programs and Resources, Office of | OPR |
| Science Information Service, Office of | SIS |
| Science Resources Studies, Division of | SRS |
| Social Sciences, Division of | SOC |
| Social Systems and Human Resources, Division of | SSHR |
| Systems Integration and Analysis, Office of | SIA |
| Undergraduate Education in Science | UES |



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